NASA Technical Memorandum 81364

USER'S MANUAL FOR FSLIP-3,
FLEXSTAB LOADS INTEGRATION PROGRAM

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1.0 INTRODUCTION

In the last decade, computer programs for theoretical aerodynamic analysis have evolved with increasing accuracy and sophistication. A most useful output from these panel method programs is the prediction of surface pressures on fairly arbitrary three dimensional configurations. These surface pressures can be integrated to obtain total forces and moments on complete configurations or airloads acting on individual vehicle components.

The FLEXSTAB computer program system (references 1-4) is being evaluated at NASA Dryden Flight Research Center for the prediction of airloads on rigid and aeroelastic configurations. Predicted airloads are being compared with wind tunnel and flight measured loads for a variety of vehicles including the B-1 and Space Shuttle Orbiter (reference 5). An existing FLEXSTAB module called ALOADS was written to integrate pressures to obtain airloads. However, certain restrictions in the ALOADS module make it ill-suited for predicting airloads which are comparable to many typical flight measured airloads. The most important restriction is that the pressures are summed at a user-specified point relative to the reference axis system which means the integration axis must be parallel to the model centerline with no sweep angle. The ALOADS model is also limited to symmetric flight conditions.

Because of these restrictions, a new follow-on integration program called FSLIP was written which has expanded capabilities and flexibility. FSLIP is generalized to work on any FLEXSTAB model with no restriction on the type of case or definition of the integration axis system. The effective area, bending arm, and torque arm for each panel can be individually defined. FSLIP also has a built-in interface with the FLEXSTAB GDTAPE data base to automatically generate the geometric integration data. Included in the program is an option for computing airloads derived from linearized wind tunnel coefficients for comparison to FLEXSTAB predicted loads.

This report consitutes the FSLIP program documentation and user's manual. An outline of the computational tasks is followed by sections describing the program's organization, execution, detailed data input, and output. Examples are included which illustrate the main program options. A microfiche supplement contains a listing of the source code and reference map.

2.0 SYMBOLS AND ABBREVIATIONS

The program assumes all varibles are input in U.S. Customary Units as specified below.

B	bending moment airload, in-lbs
BP	butt plane, in.
b/2	reference semispan of a load station, in.
C_{i1}, C_{i2}, C_{i3}	shear, bending, and torque constants, respectively (eq. 7)
C_V, C_B, C_T	shear, bending, and torque airload coefficients (eq. 4, 5, and 6, respectively)
C_{VBT}	generalized airload coefficient (eq. 8-14)
c	reference chord of a load station, in.
FS	fuselage station, in.
L_i	generalized airload (eq. 7)
P	rolling velocity, deg/sec, positive left wing up
Q	pitching velocity, deg/sec, positive nose up
$\bar{q}$	free stream dynamic pressure, psf
R	yawing velocity, deg/sec, positive nose right
R_i	radius at a slender body aerocentroid, in.
S	reference area of a load station, ft^2
s_i	effective area of a panel, in^2
T	torque airload, in-lbs
V	shear airload, lbs
V_t	true velocity, ft/sec
WL	waterline, in.
X_A, Y_A	integration axis coordinate system

X_{A_0}, Y_{A_0}	coordinates defining the origin of a thin body integration axis system, in. (fig. 6)
X_{C_i}	effective centroid of a slender body panel, in.
X_{FWD}, X_{AFT}, X_{MR}	coordinates defining a slender body integration, in. (fig. 8)
X_M, Y_M, Z_M	slender body local coordinate system
X_N, Y_N, Z_N	thin body local coordinate system
x_i	effective torque arm of a panel, in.
y_i	effective bending arm of a panel, in.
α	angle of attack, deg, positive nose up
$\dot{\alpha}$	angle of attack derivative, deg/sec, positive nose up
β	angle of sideslip, deg, positive nose left
δ_H	symmetric horizontal tail deflection $(\delta_{H_L}+\delta_{H_R})/2$, deg, positive trailing edge down
$\delta_{H'}$	asymmetric horizontal tail deflection $(\delta_{H_L}-\delta_{H_R})/2$, deg, positive produces right roll
δ_{RL}	lower rudder deflection, deg, positive trailing edge left
δ_{RU}	upper rudder deflection, deg, positive trailing edge left
δ_{SP_L}	left spoiler deflection, deg, negative trailing edge up
δ_{SP_R}	right spoiler deflection, deg, positive trailing edge up
ΔCP_i	differential pressure coefficient of a panel
Δx_{HT}	horizontal tail moment transfer arm, longitudinal, in., (eq. 16)
Δx_i	effective longitudinal width of a slender body panel, in.
Δx_{VTR}	vertical tail root moment transfer arm, longitudinal, in., (eq. 18)

Δy_{HT}	horizontal tail moment transfer arm, lateral, in., (eq. 19)
Δz_{VTR}	vertical tail root moment transfer arm, vertical, in., (eq. 19)
Λ_A	sweep angle of a thin body integration axis system, deg

Subscripts:

AF	aft fuselage
A/S	asymmetric
c/o	carryover effect
FF	forward fuselage
LHT, RHT	left and right horizontal tail
LW, RW	left and right wing
SYM	symmetric
UVT	upper vertical tail
VT	vertical tail
VTR	vertical tail root

3.0 COMPUTATIONAL TASK DESCRIPTION

Sections 3.1, 3.2, and 3.3 outline the major computational tasks performed by the program. Section 3.4 discusses the sign convention for the loads.

3.1 Pressure Integrated Loads

The primary program task is to integrate pressures on a finite number of panels making up a single thin or slender body. The pressures are summed relative to an integration axis system to produce shear, bending, and torque loads as follows:

$$V = \bar{q} \sum_i \Delta CP_i \cdot s_i \tag{1}$$

$$B = \bar{q} \sum_i \Delta CP_i \cdot s_i \cdot y_i \tag{2}$$

$$T = \bar{q} \sum_i \Delta CP_i \cdot s_i \cdot x_i \tag{3}$$

The integration geometry for each load station is stored on a data base for repeated use. The pressure coefficients are stored on a separate data base for each case to be processed. Each body may have a left and right hand side or be a single body on the vehicle centerline. Thin bodies have a single ΔCP acting normal to each panel. Slender bodies may have both a vertical and lateral ΔCP.

The total integrated loads at each station are reduced to standard non-dimensional form as follows:

$$C_V = V / (\bar{q} \cdot S) \tag{4}$$

$$C_B = B / (\bar{q} \cdot S \cdot b/2) \tag{5}$$

$$C_T = T / (\bar{q} \cdot S \cdot c) \tag{6}$$

3.2 Additional Loads Option

Once the pressure integrated loads have been computed, a program option allows a new load station to be defined which is a linear combination of previously defined loads. An additional load definition takes the generalized form of a matrix equation:

$$\begin{bmatrix} V & B & T \end{bmatrix} = \begin{bmatrix} C_{01} & C_{02} & C_{03} \end{bmatrix} + \begin{bmatrix} L_1 & L_2 & \cdots & L_i \end{bmatrix} \begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{21} & C_{22} & C_{23} \\ \vdots & \vdots & \vdots \\ C_{i1} & C_{i2} & C_{i3} \end{bmatrix} \tag{7}$$

3.3 Wind Tunnel Loads Option

This program option computes airloads based on linearized coefficients derived from wind tunnel or other load surveys. Table 1 lists the aerodynamic effects applicable to 5 types of load stations. The overall format is based on the airload coefficients derived for the B-1 aircraft in reference 6. The total load coefficients at each station are built up from the components as listed in the generalized equations below. Particular attention should be paid to the units and sign conventions for each component.

3.3.1 Wing station.-

Left side:

$$
\begin{aligned}
C_{VBT_{LW}} = {} & C_{VBT_{\alpha=0}} + C_{VBT_{\alpha}}\,\alpha + C_{VBT_{\dot{\alpha}}}\left(\frac{\dot{\alpha}\,C_W}{2V_t}\right) - C_{VBT_{\delta_{SP}}}\,\delta_{SP_{LW}} \\
& + C_{VBT_P}\left(\frac{Pb_W}{2V_t}\right) + C_{VBT_Q}\left(\frac{QC_W}{2V_t}\right) \qquad (8L) \\
& + \left[C_{VBT_{\substack{\beta\alpha=0\\ SYM}}} + C_{VBT_{\substack{\beta\alpha=0\\ A/S}}} + \left(C_{VBT_{\beta\alpha_{SYM}}} + C_{VBT_{\beta\alpha_{A/S}}}\right)\alpha\right]\beta
\end{aligned}
$$

Right side:

$$
\begin{aligned}
C_{VBT_{RW}} = {} & C_{VBT_{\alpha=0}} + C_{BVT_{\alpha}}\,\alpha + C_{VBT_{\dot{\alpha}}}\left(\frac{\dot{\alpha}\,C_W}{2V_t}\right) + C_{VBT_{\delta_{SP}}}\,\delta_{SP_{RW}} \\
& - C_{VBT_P}\left(\frac{Pb_W}{2V_t}\right) + C_{VBT_Q}\left(\frac{QC_W}{2V_t}\right) \qquad (8R) \\
& + \left[C_{VBT_{\substack{\beta\alpha=0\\ SYM}}} - C_{VBT_{\substack{\beta\alpha=0\\ A/S}}} + \left(C_{VBT_{\beta\alpha_{SYM}}} - C_{VBT_{\beta\alpha_{A/S}}}\right)\alpha\right]\beta
\end{aligned}
$$

TABLE I.- AERODYNAMIC EFFECTS APPLICABLE TO COMPONENT LOADS

Effect	Wing	Horiz tail	Vert tail	Fwd fus	Aft fus
$\alpha = 0$	X	X		X	X
α	X	X		X	X
$\dot{\alpha}$	X	X			
β		X		X	X
δ_H (sym horiz tail defl)		X			
δ_H' (anti sym horiz tail defl)		X	X		X
δ_{SP} (spoiler defl)	X	X	X		
δ_{SP} c/o (horiz tail carryover)		X			
δ_{RU} (upper rudder defl)			X		
δ_{RL} (lower rudder defl)			X		X
P (damping in roll)	X	X	X	X	X
Q (damping in pitch)	X	X			
R (damping in yaw)			X		
β $\alpha = 0$ A/S (wing)	X				
β $\alpha = 0$ Sym (wing)	X				
$\beta\alpha$A/S (wing)	X				
$\beta\alpha$Sym (wing)	X				
β $\alpha = 0$ (vert tail)			X		
$\beta\alpha$ (vert tail)			X		
β $\alpha = 0$ c/o (aft fus carryover)					X
$\beta\alpha$ c/o (aft fus carryover)					X

X = Applicable aerodynamic effect

3.3.2 Horizontal tail station.-

Left side:

$$
\begin{aligned}
C_{VBT_{LHT}} = {} & C_{VBT_{\alpha=0}} + C_{VBT_{\alpha}}\alpha + C_{VBT_{\delta_H}}\delta_H + C_{VBT_{\dot{\alpha}}}\left(\frac{\dot{\alpha}\, C_{HT}}{2V_t}\right) \\
& + C_{VBT_{\delta_{H'}}}\delta_{H'} + C_{VBT_{\beta}}\beta - C_{VBT_{\delta_{SP}}}\delta_{SP_L} + C_{VBT_{\delta_{SP_{c/o}}}}\delta_{SP_R} \\
& + C_{VBT_P}\left(\frac{Pb_{HT}}{2V_t}\right) + C_{BVT_Q}\left(\frac{QC_{HT}}{2V_t}\right)
\end{aligned} \tag{9L}
$$

Right side:

$$
\begin{aligned}
C_{VBT_{RHT}} = {} & C_{VBT_{\alpha=0}} + C_{VBT_{\alpha}}\alpha + C_{BVT_{\delta_H}}\delta_H + C_{BVT_{\dot{\alpha}}}\left(\frac{\dot{\alpha}\, C_{HT}}{2V_t}\right) \\
& - C_{VBT_{\delta_{H'}}}\delta_{H'} - C_{VBT_{\beta}}\beta + C_{VBT_{\delta_{SP}}}\delta_{SP_R} - C_{VBT_{\delta_{SP_{c/o}}}}\delta_{SP_L} \\
& - C_{VBT_P}\left(\frac{Pb_{HT}}{2V_t}\right) + C_{VBT_Q}\left(\frac{QC_{HT}}{2V_t}\right)
\end{aligned} \tag{9R}
$$

3.3.3 Vertical tail station.-

$$
\begin{aligned}
C_{VBT_{VT}} = {} & \left[C_{VBT_{\beta\alpha=0}} + C_{VBT_{\beta\alpha}}\alpha\right]\beta + C_{VBT_{\delta_{H'}}}\delta_{H'} \\
& + C_{VBT_{\delta_{SP}}}\left(\delta_{SP_R} + \delta_{SP_L}\right) + C_{VBT_{\delta_{RU}}}\delta_{RU} \\
& + C_{VBT_{\delta_{RL}}}\delta_{RL} + C_{VBT_P}\left(\frac{Pb_{VT}}{2V_t}\right) + C_{VBT_R}\left(\frac{Rb_{VT}}{2V_t}\right)
\end{aligned} \tag{10}
$$

3.3.4 Forward fuselage station.-

Vertical :

$$C_{VBT_{FF}} = C_{VBT_{\alpha=0}} + C_{VBT_{\alpha}} \alpha \tag{11}$$

Lateral :

$$C_{VBT_{FF}} = C_{VBT_{\beta}} \beta + C_{VBT_{P}} \left(\frac{Pb_{FF}}{2V_t}\right) \tag{12}$$

3.3.5 Aft fuselage station.-

Vertical :

$$C_{VBT_{AF}} = C_{VBT_{\alpha=0}} + C_{VBT_{\alpha}} \alpha \tag{13}$$

Lateral :

$$C_{VBT_{AF}} = \left(C_{VBT_{\beta\alpha=0_{c/o}}} + C_{VBT_{\beta\alpha_{c/o}}} \alpha\right)\beta + C_{VBT_{\delta_{H'}}} \delta_{H'} + C_{VBT_{\delta_{RL}}} \delta_{RL}$$

$$+ C_{VBT_{P}} \left(\frac{Pb_{AF}}{2V_t}\right) + C_{VBT_{\beta}} \beta \tag{14}$$

The TOTAL vertical and lateral airloads at the aft fuselage station can be computed by adding the tail induced components to the airloads on the aft fuselage itself :

Vertical :

$$V_{AF} = (C_{V_{AF}} \bar{q} S_{AF}) + (V_{LHT} + V_{RHT}) \tag{15}$$

$$B_{AF} = (C_{B_{AF}} \bar{q} S_{AF} b_{AF}/2) + (V_{LHT} + V_{RHT}) \Delta x_{HT} - (T_{LHT} + T_{RHT}) \tag{16}$$

Lateral :

$$V_{AF} = (C_{V_{AF}} \bar{q} S_{AF}) + V_{VTR} \tag{17}$$

$$B_{AF} = (C_{B_{AF}} \bar{q} S_{AF} b_{AF}/2) + V_{VTR} \Delta x_{VTR} - T_{VTR} \tag{18}$$

$$T_{AF} = (C_{T_{AF}}\ \bar{q}\ S_{AF}\ c_{AF}) + V_{VTR}\ \Delta z_{VTR} + B_{VTR}$$

$$+ (V_{LHT} - V_{RHT})\ \Delta y_{HT} + (B_{LHT} - B_{RHT}) \qquad (19)$$

3.4 Sign Convention for Loads

Figure 1 shows the sign convention for positive shear loads. Note that for thin bodies off the centerline, positive shear load is always in the direction of the LOCAL Z_N axis normal to the surface. For slender bodies off the centerline, positive shears are always in the direction of the LOCAL Y_M and Z_M axes. For all bodies on the centerline, positive shear is always to the right.

Positive bending and torque loads for the right side thin bodies obey the right hand rule about the local X and Y axes respectively (positive tip and leading edge up). The left side axes are a mirror image of the right side. For slender bodies, a program option allows the user to define the convention for positive bending moments (either nose up, nose right, tail up, or tail right).

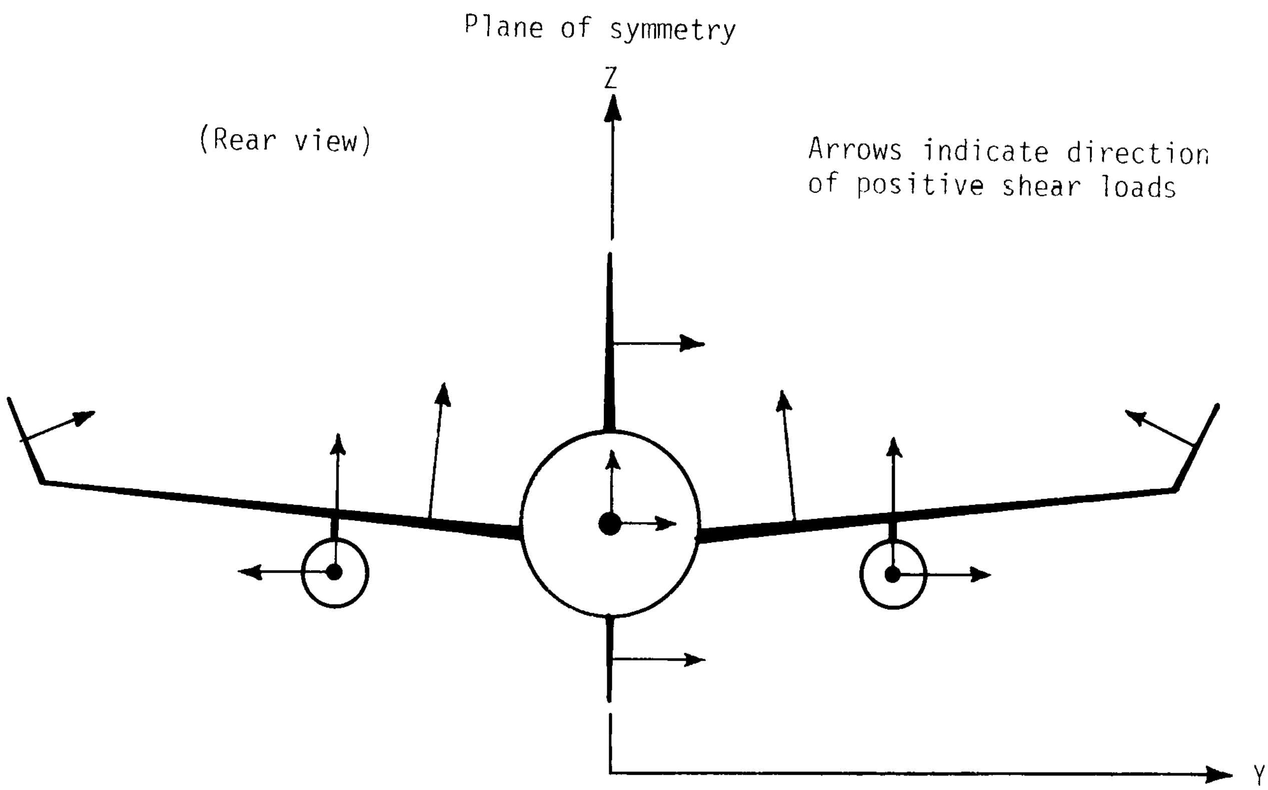

Figure 1. Sign convention for positive shear loads.

4.0 PROGRAM DESCRIPTION

The FSLIP-3 program is written in FORTRAN Extended Version 4 (reference 7). Current length is 1535 statements including comments. A complete listing of the source code with reference maps is included in a microfiche supplement attached to the inside back cover.

4.1 Main Program Organization

The primary function of the main program is to control the execution of subroutines which create or use various mini data bases. A simplified flowchart of the main program is shown in figure 2. The program first reads execution control information. If requested, an integration geometry data base is next created by a call to the geometry option subroutine (GOPSR). If no other options are requested, execution stops at this point. A call to the wind tunnel option subroutine (WOPSR) creates a data base containing wind tunnel load coefficients. Next, data describing each case (e.g. α, β, $\bar{q}$, δ_e, etc.) are read in. If the pressure data is input on cards, the pressure option subroutine (POPSR) is called to create this data base.

At this point (labeled A) all data input is complete and the program proceeds with the computational options. A call to the integration option subroutine (IOPSR) generates the pressure integrated loads. If specified on the geometry data base, this subroutine also computes any additional loads defined as a linear combination of previously computed loads. If wind tunnel derived loads are desired, the wind tunnel option subroutine (WOPSR) is called again. At this point, all loads have been computed and the only remaining task is an option to print a summary of specified results in a very concise format.

4.2 Input/Output Data Flow

As just discussed, a set of subroutines creates or uses a number of discrete disk files containing data required by the computational options. Table 2 describes the function of each disk file allocated for data input or output. The overall data flow between the subroutines is shown in figure 3 and is discussed below in terms of the primary program options. Specific details of the unformatted disk files are provided in the DATA INPUT DESCRIPTION (sections 6.2, 6.3, and 6.5).

4.2.1 Geometry Option.- The surface/axis data file (Tape 20) provides the foundation for the integration process. For each integration, this data base contains the effective area, bending arm, and torque arm for each panel on the specified body. The user has several means of creating the surface/axis data file via subroutine GOPSR which is controlled by the geometry option parameter (GOP). If GOP = 1, the file is assumed to exist and the subroutine is not called. GOP = 2 indicates that the file is copied from card input. GOP = 0 means the file is not input.

An initial run is usually made with GOP = 3 or 4 which uses the FLEXSTAB GDTAPE. The user simply specifies the FLEXSTAB body along with the integration

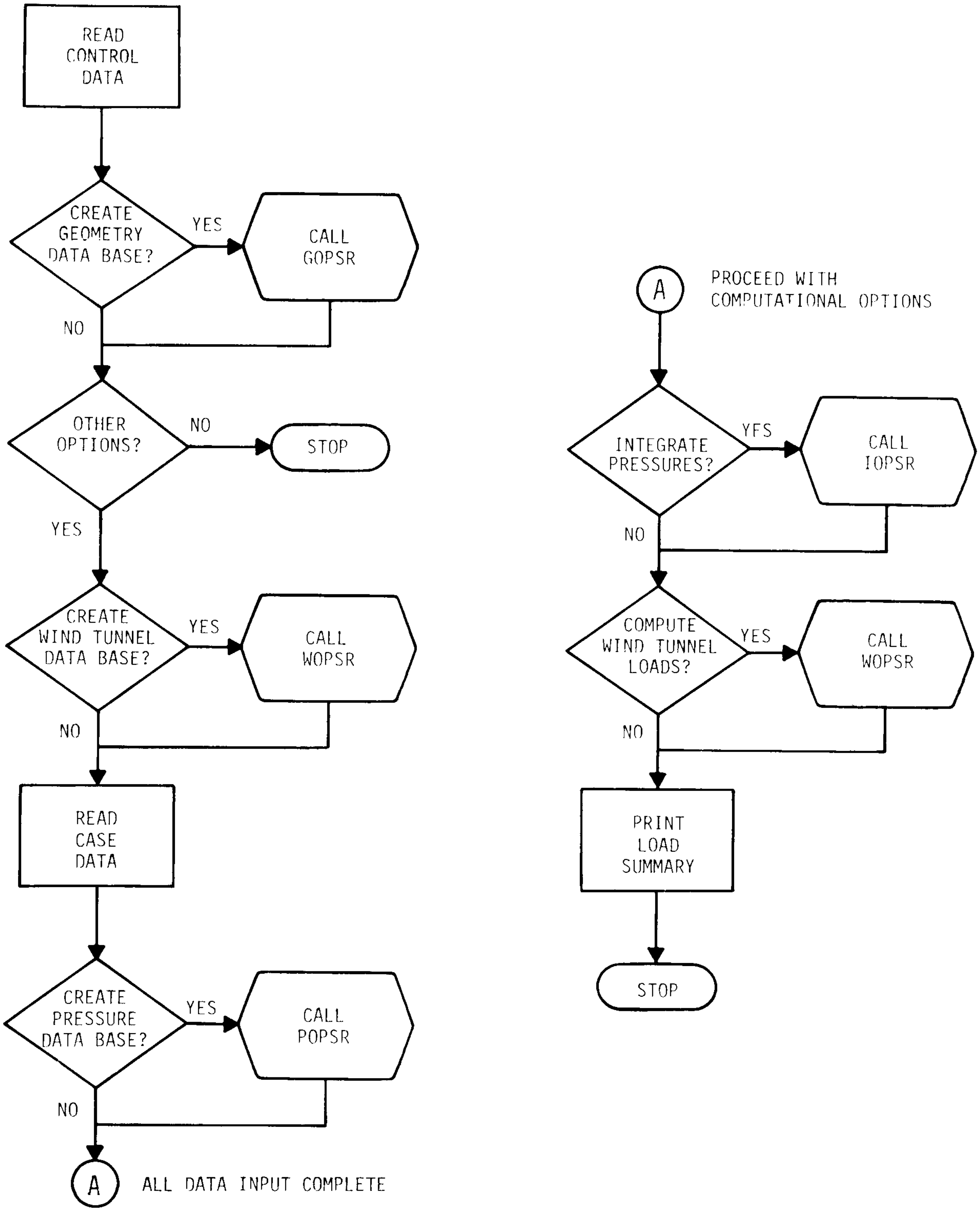

Figure 2. Main program simplified flowchart.

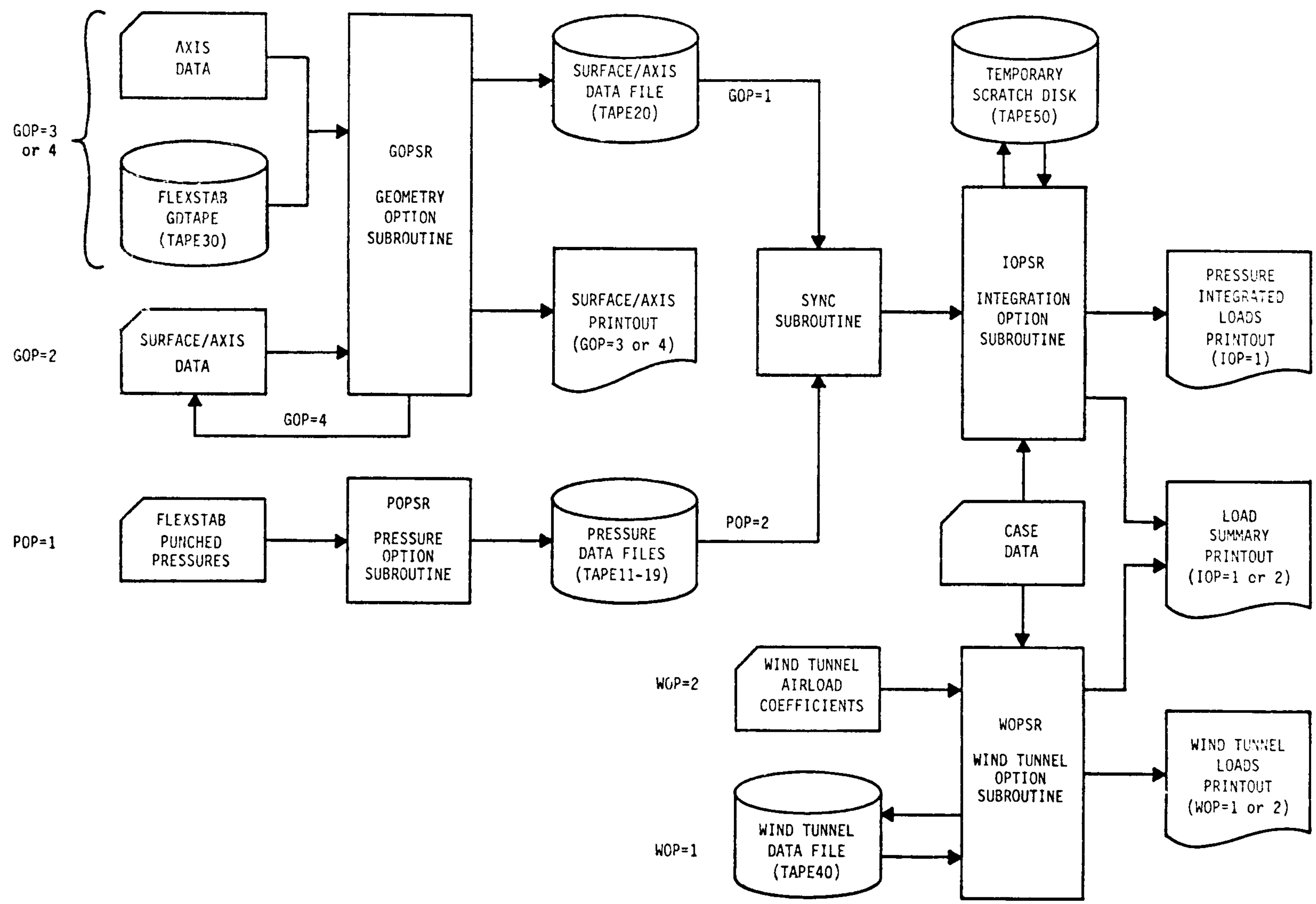

Figure 3. Input/output data flow.

TABLE 2. INPUT/OUTPUT DISK FILES

Logical File Name	Description
TAPE 11 thru TAPE 19	Contains panel pressure coefficients, one file per case, up to 9 cases per job. These files are normally copied from FLEXSTAB punched card decks.
TAPE 20	Contains surface/axis geometry information for each load station on each thin or slender body. This file is normally created from card input and cataloged for later runs.
TAPE 30	FLEXSTAB GDTAPE - This permanent file can be accessed to automatically generate the surface/axis geometry file (TAPE 20).
TAPE 40	Contains airload coefficients for the wind tunnel derived loads option. There is usually a different file for each Mach number/vehicle configuration. This file is normally created from card input and cataloged for later runs.
TAPE 50	Temporary internal scratch disk used by the integration option subroutine.

axis location and GOPSR automatically computes the data for each panel and creates the data base. A printout is generated which lists complete details of the integration definition. If GOP = 4, the surface/axis file is also punched on cards. This option gives the user a means to manually override the computed values on selected panels for special cases. The modified deck is then rerun using GOP = 2. This procedure is fully discussed in section 6.2 and illustrated with an example in section 8.

4.2.2 Pressure Option.- The panel pressure data are usually input from FLEXSTAB punched card decks. In this case, the pressure option parameter (POP) = 1 which directs subroutine POPSR to copy each case to a separate unformatted disk file. If desired, these files can be cataloged for later runs where they are input directly using POP = 2. Pressure data from a source other than FLEXSTAB could be processed if input in the same card format or written directly to the disk files by the generating aerodynamic program or an interface program. If no pressure data are to be input, POP = 0.

4.2.3 Integration Option.- Subroutine IOPSR processes each integration definition on the surface/axis data file by calling subroutine SYNC which searches the current pressure file for matching pressure data. If SYNC cannot find pressure data for the specified body, a message is printed and IOPSR proceeds to the next integration. The user can also individually suppress any particular integration definition residing on the surface/

axis file. Any additional load definitions are processed after all integrations have been completed for the first case. IOPSR then recycles to repeat the process for any succeeding cases.

The user has two options when executing IOPSR which controls the printed output. For IOP = 1, a detailed listing is generated for each integration which shows the area, arms, pressure coefficient, and loads for each panel on the body. If IOP = 2, this detailed listing is suppressed and the loads summary printout option must be used to printout the total integrated loads. The case data (read from cards by the main program) are passed to IOPSR via common and is optional. Its only function in IOPSR is to provide case descriptive data printed in the page header for each integration. If IOP = 0, IOPSR is not called and no integrations are performed.

4.2.4 Wind Tunnel Option.- To compute wind tunnel derived airloads, subroutine WOPSR is initially executed with WOP = 2, which copies the load coefficients from card input to the unformatted disk file. Future runs are then made by using the file directly with WOP = 1. For either option, the load coefficient data file is combined with the case describing data to compute the airloads for each case. The wind tunnel loads printout produces a listing of the coefficients and component loads for each aerodynamic effect.

For comparison purposes, a summary of the wind tunnel loads can be printed out along with the pressure integrated load only if the integration option is executed. The wind tunnel option can also be executed by itself by setting GOP, POP, and IOP to zero. In this mode, only the standard wind tunnel loads printout is generated. If WOP = 0, WOPSR is not called. Creation of the wind tunnel data file is described in detail in section 6.3 and illustrated with an example in section 8.2.

4.3 Option Requirements

The input and computational options discussed above are listed in detail in the input description for CARD 1 (section 6.1). The user can individually select the form by which the data input files are created or accessed and the computational options performed on these files. In general, any combination of program options are allowed through proper system control cards (see JCL section 5.1 and 5.2). The only requirements are listed below.

1. Execution of the geometry option with GOP = 3 or 4 requires access to a FLEXSTAB GDTAPE (TAPE 30).

2. Execution of the integration option requires access to both a surface/axis data file (TAPE 20) and a pressure data file for each case (TAPE 11-19). Thus if either GOP or POP = 0, IOP must = 0.

3. Execution of the wind tunnel option requires access only to a airload coefficient file (TAPE 40).

4.4 Program Restrictions and Limitations

4.4.1 FLEXSTAB Dependent.- The FSLIP program was written to be compatible with any FLEXSTAB GD model. Thus any restrictions in the GD module (ref. 2-4) also apply to FSLIP. While there is no limit on the number of bodies defining a GD model, each slender body is limited to 100 control points and each thin body is limited to 200 panels.

The most important restriction affecting FLEXSTAB jobs involves the use of units. FSLIP assumes the aerodynamic model is defined in inches, thus the units option in the GD module must be INCHES. FSLIP also assumes that dynamic pressure is in PSF, thus the units option in the SDSS module must be IN/FT or FT.

When interfacing with the GDTAPE (GOP = 3 or 4), FSLIP is compatible with any GDTAPE except those produced by Level 3.02 FLEXSTAB. The GDTAPE file structure for Level 3.02 was changed (reference 8) which affects the read statements in GOPSR. There are two ways to circumvent this problem for the user of Level 3.02 FLEXSTAB. The read statements in GOPSR can be changed to be compatible with Level 3.02 or the user can maintain access to an earlier level GD module for creating a FSLIP compatible GDTAPE. Under the FLEXSTAB system, the GDTAPE may contain multiple files with each file defining a different GD model. FSLIP reads the currently positioned file, thus if the user wishes to process other than the first file, appropriate SKIP or COPY utilities should be used to position the desired file after attaching the GDTAPE.

4.4.2 FSLIP Dependent.- Result arrays in FSLIP are currently sized to handle up to 9 different pressure cases per run. The surface/axis data file can contain up to 50 load stations to be processed for each case. The pressure data is usually input from card decks punched by the SD & SS module in FLEXSTAB. However, SD & SS is limited to punching thin body pressures only. If the user wishes to compute loads on slender bodies (such as fuselage loads), FSLIP has provisions for manually adding the slender body force coefficients (computed by SD & SS) to the thin body pressure decks. This procedure is described in section 6.5.

A very general restriction in FSLIP relates to the printed output which makes extensive use of fixed field F formats. These fields have been sized to handle physically realistic problems, and thus should not present a practical limitation. Specific restrictions related to the detailed card input is discussed in the DATA INPUT DESCRIPTION (section 6).

5.0 PROGRAM EXECUTION

FSLIP is presently operational on DFRC's CDC Cyber 73 computer. The program has been executed using both the SCOPE and NOS operating systems. Section 5.1 describes the Job Control Language (JCL) required for the SCOPE 3.4 operating system (reference 9). Section 5.2 contains the JCL required for the NOS 1.4 operating system (reference 10).

5.1 SCOPE JCL

To execute the FSLIP program using SCOPE, the following system control cards are required:

1. Job Card.
2. XXXXX,T300,FTN,YYYY.
3. ATTACH(LGO,FSLIP3,ID=SIMS,MR=1)
4. REQUEST(TAPEXX,*PF)
5. ATTACH(TAPEXX,YYYYYYY,ID=ZZZZ,MR=1)
6. MAP(OFF)
7. LGO(PL=10000)
8. CATALOG(TAPEXX,YYYYYYY,ID=ZZZZ)
9. 7/8/9 End of file card
10. Data Input Deck
11. 6/7/8/9 End of job card

NOTES:

Card 1 - Estimated wall clock time of 2 to 5 minutes should be sufficient for most jobs.

Card 2 - XXXXX = User's Job Name

YYYY = Subtask number

Card 4 and 8 - These two cards are included for each data file to be input on cards and cataloged for use in later runs.

XX = 11	For pressure data file, case 1
12	" " " " , case 2
13	" " " " , case 3
14	" " " " , case 4
15	" " " " , case 5
16	" " " " , case 6
17	" " " " , case 7
18	" " " " , case 8
19	" " " " , case 9
20	For surface/axis data file
40	For wind tunnel data file

YYYYYYY = Permanent File Name

ZZZZ = Owner I.D.

Card 5 - This card is included for each previously cataloged data file to be accessed for job execution. The parameters XX, YYYYYYY, and ZZZZ are the same as for CARD 8, with the addition:

XX = 30 for the FLEXSTAB GDTAPE

Card 7 - For large jobs, the print limit may have to be increased. See section 7.1 for estimating amount of printout.

5.2 NOS JCL

To execute the FSLIP program using NOS, the following system control cards are required:

1. Job Card
2. XXXXX,T300.
3. USER(XXXX,YY)
4. CHARGE(XX,YY,FTN)
5. ATTACH(LGO=FSLIP3/UN=SIMS)
6. DEFINE(TAPEXX=YYYYYYY/CT=SPRIV)
7. ATTACH(TAPEXX=YYYYYYY)
8. LDSET(PRESET=ZERO)
9. MAP(OFF)
10. LGO(PL=10000)
11. 7/8/9 End of file card
12. Data Input Deck
13. 6/7/8/9 End of job card

NOTES:

Card 2 - XXXXX = User's Job Name

Card 3 - XXXX = User's name

YY = User's password

Card 4 - XX,YY = Subtask number

Card 6 - This card replaces cards 4 and 8 defined above for SCOPE with the same XX and YYYYYYY parameters.

Card 7 - This card replaces card 5 defined above for SCOPE with the same XX and YYYYYYY parameters.

5.3 CM and CP Time Requirements

FSLIP requires a maximum execution field length of approximately 115K octal words. Execution CP times are very problem size dependent but relatively quick. Most average size jobs run in 10 to 20 CP seconds. The largest size jobs may require approximately 100 CP seconds.

6.0 DATA INPUT DESCRIPTION

This section contains a detailed description of the card input deck required for execution. Figure 4 illustrates the overall card deck structure which is broken down into 5 major sections. Section 6.1 contains program control data defined with card types 1 through 4. Section 6.2 is the surface/axis data file (card types 5 through 11). Section 6.3 is the wind tunnel data file (card types 12 through 15). Card types 16 through 18 make up section 6.4 containing case description data. Section 6.5 is the pressure data file (card types 19 through 24) which is repeated for each case to be processed. Section

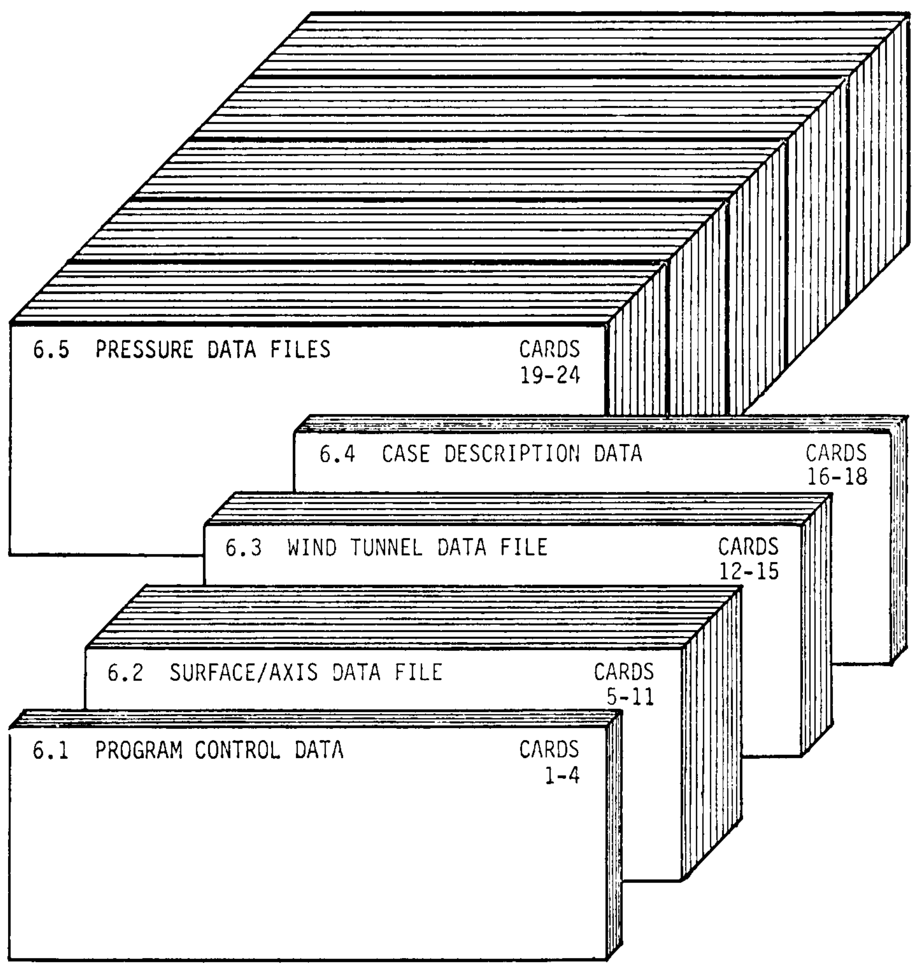

Figure 4. Overall card deck structure.

6.1 is always required for execution. Sections 6.2, 6.3, 6.4, and 6.5 are optional depending on the input options defined on CARD 1. Each of the five major sections are described separately.

6.1 Program Control Data (CARDS 1-4)

The card arrangement for the program control data is shown in figure 5. Particular attention should be paid to the option control parameters on CARD 1 as they affect most of the downstream cards. CARDS 2A and 2B control which integrated and wind tunnel loads are computed. CARD SET 3 controls the summary print option.

In the detailed card descriptions that follow, each data field is listed with its card columns, format, descriptor name, and explanation. In addition, 4 columns labeled R, S, I, and W denote the major computational options listed on CARD 1 as the Repunch option, Section data option, Integration option, and Wind tunnel option. The Repunch and Section data options are not currently incorporated in FSLIP but have been included for compatibility reasons because several input fields have been allocated for varibles that apply only to the Repunch or Section data options. If an X appears in a particular column, it signifies that the varible applies to that option and should be defined. If the column is blank, the varible does not apply to that option and the field may be left blank. If an I appears in the column, it denotes a varible that is not used in any computation but provides information that will be printed as part of the page headers.

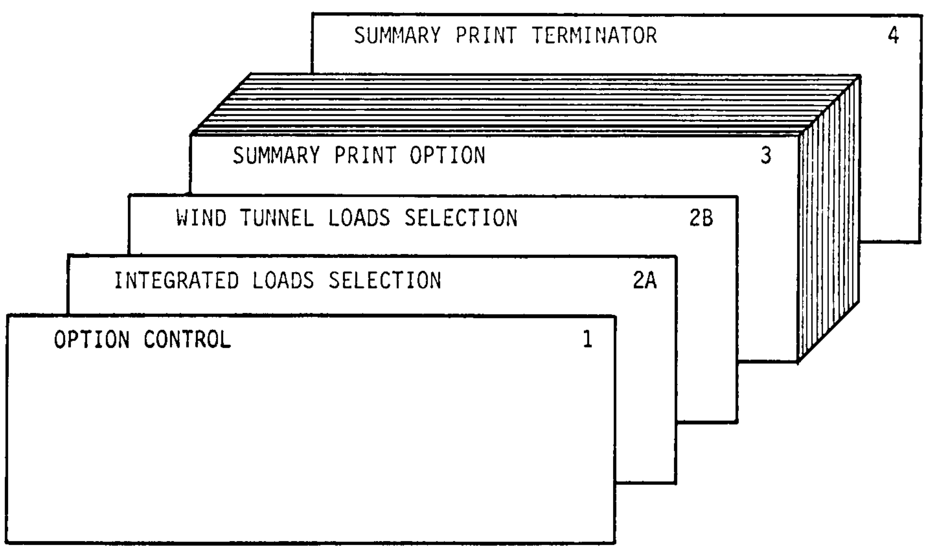

Figure 5. Card arrangement for the program control data.

CARD 1 - OPTION CONTROL.

Note: The following options are not currently available:
ROP=1, ROP=2
SOP=1

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
10	I1	GOP			X		Geometry input option. = 0 : Surface/axis data not input. = 1 : Data on disk (TAPE20). = 2 : Data read from cards, copied to disk. = 3 : Data computed from input and GDTAPE (TAPE30). = 4 : Data computed and punched from input and GDTAPE (TAPE30).
20	I1	POP			X		Pressure data input option. = 0 : Data not input. = 1 : Data on cards (punched by SD&SS) = 2 : Data on disk (TAPE11-19).
30	I1	ROP	X				Repunch pressure data option. = 0 : Not desired. = 1 : Repunch ΔCP data with new x/c's. = 2 : Punch non-FLEXSTAB ΔCP data.
40	I1	SOP		X			Section data option. = 0 : Not desired. = 1 : Section data computed.
50	I1	IOP			X		Integration option. = 0 : Not desired. = 1 : Integrate pressures and print panel by panel details. = 2 : Integrate pressures but suppress panel by panel details. Summary print option (CARD SET 3) must be used to print loads.
60	I1	WOP				X	Wind tunnel loads option. = 0 : Not desired. = 1 : Compute wind tunnel loads-coefficients on disk (TAPE40). = 2 : Compute wind tunnel loads-coefficients read from cards, copied to disk.

CARD 2A - INTEGRATED LOADS SELECTION.

OMIT this card if IOP=0 (CARD 1).

The card column number corresponds to the load station number defined on CARD 6 or 10. One column for each load station - up to 50 maximum.

Applies to all cases processed in this job.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-50	50L1	WGI			X		Load station selection. = T : Loads at this station will be computed. = F (or blank) : Loads at this station will NOT be computed.

CARD 2B - WIND TUNNEL LOADS SELECTION.

OMIT this card if WOP=0 (CARD 1).

The card column number corresponds to a particular load as listed in the table below. One column for each load - up to 14 maximum.

Applies to all cases processed in this job.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-14	14L1	WGW				X	Wind tunnel loads selection. = T : Loads at this station will be computed. = F (or blank) : Loads at this station will NOT be computed.

Load assignments:

Wind tunnel load number (WLN)	Surface number (WTN on CARD13)	Description
1 2	1 1	Wing loads - total. Wing loads - without $\alpha=0$ term.
3 4	2 2	Horizontal tail loads - total. Horizontal tail loads - without $\alpha=0$ term.
5 6	3 4	Vertical tail loads - upper. Vertical tail loads - root.
7 8	5 5	Forward fuselage - vertical loads. Forward fuselage - lateral loads.
9 10 11	6 6 6	Aft fuselage - vertical loads on fuselage itself. Aft fuselage - tail induced vertical loads. Aft fuselage - total vertical loads.
12 13 14	6 6 6	Aft fuselage - lateral loads on fuselage itself. Aft fuselage - tail induced lateral loads. Aft fuselage - total lateral loads.

CARD SET 3 - SUMMARY PRINT OPTION.

A one page summary is produced for each load station specified.

One card per load station - up to 50 maximum.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-2	I2	SPI			X		Load station number (SAN on CARD 6 or 10). Can be an integrated or additional load.
6-7	I2	SPW				X	Wind tunnel load number (WLN=1,14). If a wind tunnel load is computed that corresponds to the specified SPI, it can be printed along with the SPI load. SPW should not be specified unless SPI is non-zero.

CARD 4 - SUMMARY PRINT TERMINATOR.

This blank card signifies the end of program control data and is always included.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-2	I2	-	X	X	X	X	Leave columns blank or zero.
6-7	I2	-	X	X	X	X	Leave columns blank or zero.

6.2 Surface/Axis Data File (CARDS 5-11)

This card section is used to create the surface/axis data file when GOP = 2, 3, or 4. Once the file has been created, this card section is omitted from the input deck if GOP = 0 or 1. Some general usage guidelines are presented here followed by the detailed card input descriptions.

Unlike the FLEXSTAB ALOADS module, FSLIP applies an integration specification to one thin or slender body at a time. More than one integration can be specified for a particular body. For each integration, the data file contains the effective area, bending arm, and torque arm for each panel on the specified body. Two methods are available for creating the data file which are discussed separately in sections 6.2.5 and 6.2.6.

6.2.1 Thin body integrations.- Figure 6 shows an example of the integration geometry for a typical thin body. The panel coordinates are originally defined in the local thin body coordinate system (X_N,Y_N) as established in the FLEXSTAB GD module. An arbitrary load station is defined by the coordinates X_{A_0}, Y_{A_0} and sweep angle Λ_A which determines the bending (X_A) and torque (Y_A) axes. The bending axis may cut through certain panels with the effective area of each panel normally taken as that portion outboard of the bending axis. The effective bending and torque arms are measured normal to the axes from the effective panel centroid. Note that a panel centroid aft of the torque axis produces a negative torque arm.

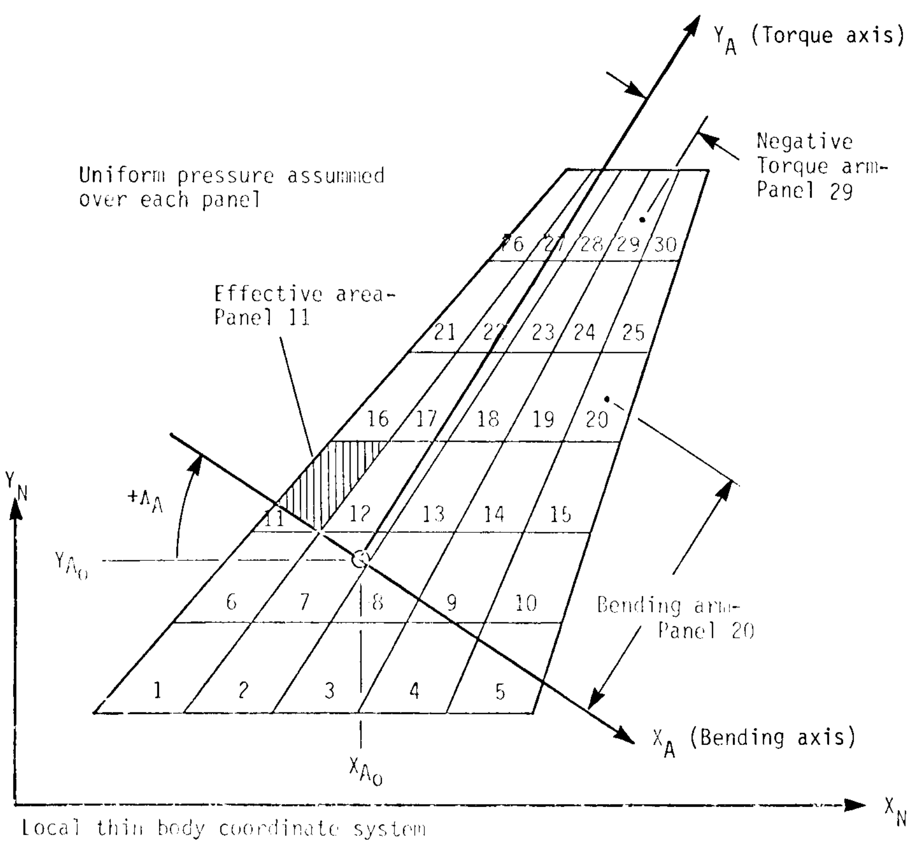

Figure 6. Integration geometry for thin body loads.

When executing GOP = 3 or 4, the geometry subroutine will automatically compute the effective panel geometry as described above. All panel areas inboard of the bending axis are set to zero. If the user wishes to override any computed values, the punched deck from GOP = 4 should be modified and resubmitted using GOP = 2.

6.2.2 Hinge moment integrations.- Control surface hinge moments can be computed as a special class of thin body integrations as shown in figure 7. In this case, the torque axis is aligned with the hinge axis of an aileron made up of 9 panels. If the effective areas of all the non-aileron panels is set to zero, the torque integration is equivalent to the hinge moment.

When executing the automatic geometry option, the bending axis should be located inboard of the aileron panels so that the total area of the 9 panels is computed. Note, however, that the geometry subroutine will also compute a non-zero area for all panels outboard of the bending axis. The user should correct the punched deck (from GOP = 4) by setting the areas of all non-aileron panels to zero. The modified deck is then input using GOP = 2.

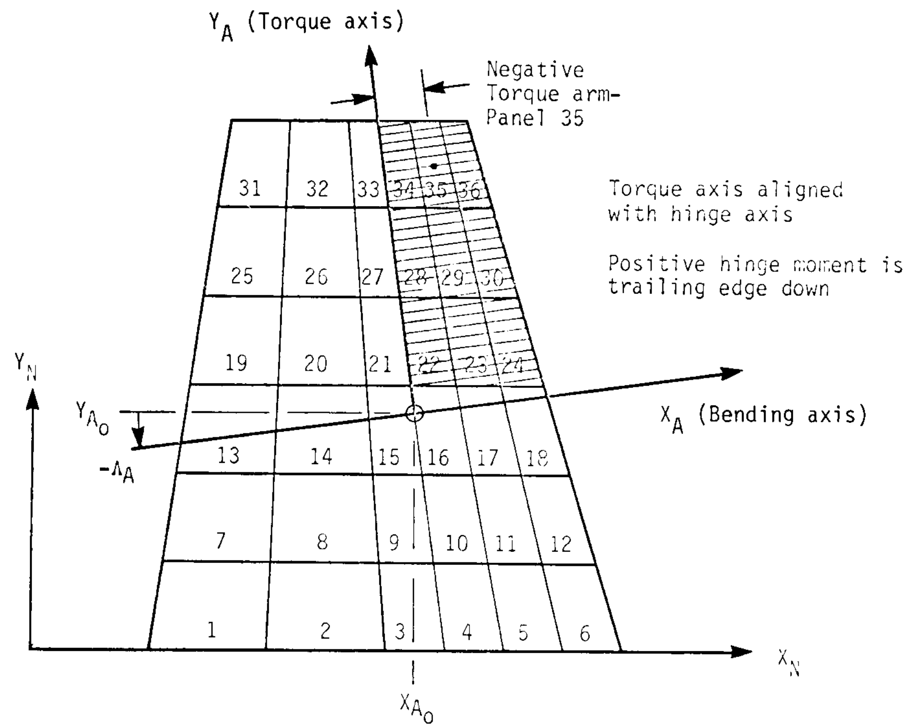

Figure 7. Integration geometry for hinge moments.

6.2.3 Slender body integrations - An example of the integration geometry for a slender body is shown in figure 8. Slender bodies are defined by a series of aerocentroids lying along the local slender body X_M axis. Each aerocentroid has a radius R_i and interval Δx_i which form the equivalent of panels within one row. Both vertical and lateral force coefficients can exist at each aerocentroid. The bending axis Y_A is established at a point along the X_M axis. The torque axis X_A is assummed to be coincident with the X_M axis which implies that torque loads are not normally computed for simple slender bodies.

When executing the automatic geometry option, the integration geometry is determined in a manner unique to slender bodies. First, an integration interval is established by the coordinates X_{FWD} and X_{AFT}. All panel areas outside of this interval are set to zero. Effective panel areas within the interval are computed as shown on the figure. The bending axis location is specified by the coordinate X_{MR} which is independent of X_{FWD} and X_{AFT}. Bending arms are computed from the midpoint of the effective panel area. The parameter MRC controls the sign convention for positive bending moments.

The example shown in the figure represents an integration definition for computing vertical loads at a forward fuselage station. An identical integration definition could be applied separately to compute lateral loads. Other types of load stations can be established by defining appropiate locations to X_{FWD}, X_{AFT}, and X_{MR}. Aft fuselage loads could be defined by placing X_{FWD} and X_{MR} at the load station and placing X_{AFT} at any point aft of the last panel area. Loads on the complete slender body could be defined by placing X_{FWD} ahead of the first panel and placing X_{AFT} aft of the last panel. Bending moments (equivalent to a pitching moment) would be summed about X_{MR} which could be placed at the body quarter chord or center of gravity.

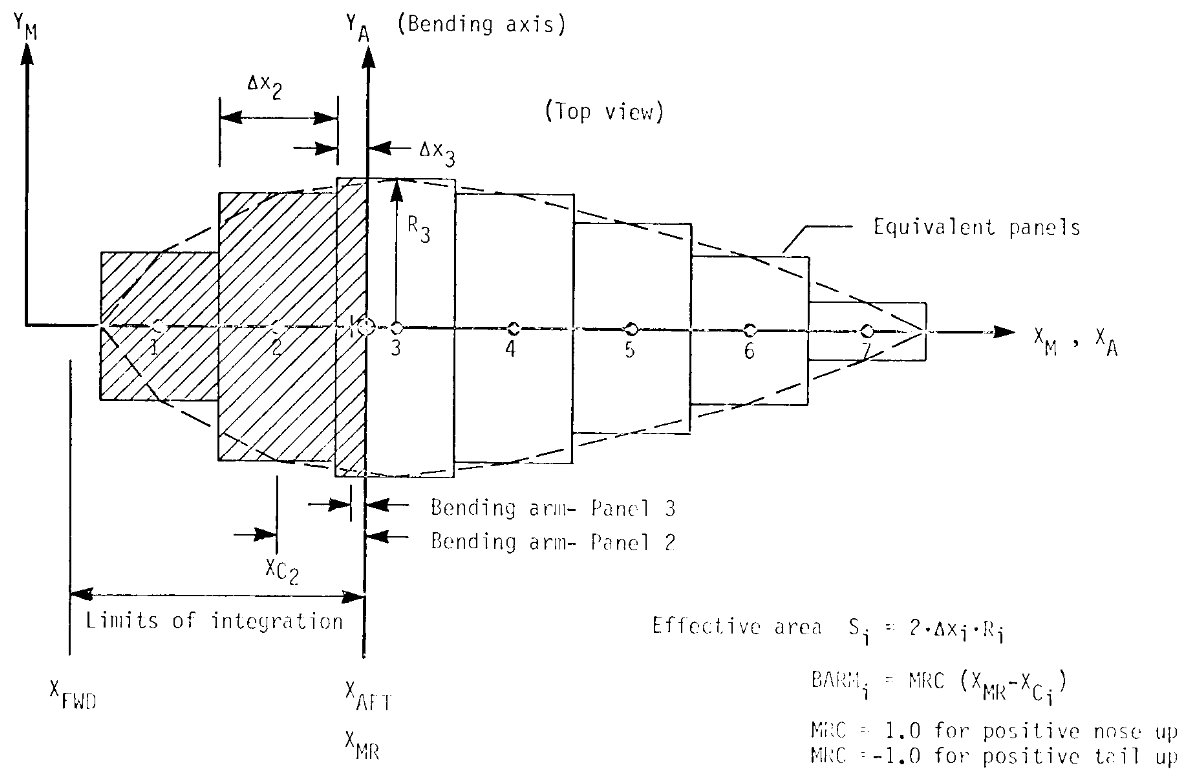

Figure 8. Integration geometry for slender body loads.

6.2.4 Additional load definitions.- This option is used to define any additional loads that are a linear combination of previously integrated loads. To illustrate the general setup, a simple example is shown in figure 9. The total shear and bending at a aft fuselage station (L_7,L_8) are to be computed. These loads are generated from the integrated loads on the aft fuselage itself (L_1,L_2) and the horizontal tail root loads (L_3-L_6). The component factors are assembled in matrix form as shown below. Each row of the matrix is read in using CARD SET 11.

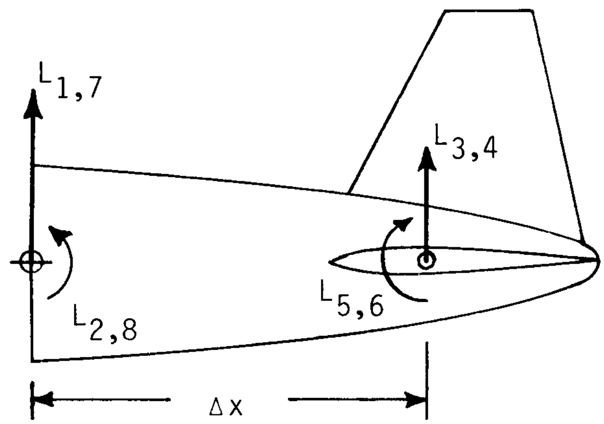

Figure 9. Additional load example.

L_1= Aft fuselage vertical shear
L_2= Aft fuselage bending

L_3= Horizontal tail shear, left
L_4= Horizontal tail shear, right

L_5= Horizontal tail torque, left
L_6= Horizontal tail torque, right

Total aft fuselage shear = $L_7 = L_1 + L_3 + L_4$
Total aft fuselage bending= $L_8 = L_2 + \Delta x \cdot L_3 + \Delta x \cdot L_4 - L_5 - L_6$
Total aft fuselage torque = $L_9 = 0$

$$\begin{bmatrix} L_7 & L_8 & L_9 \end{bmatrix} = \begin{bmatrix} L_1 & L_2 & L_3 & L_4 & L_5 & L_6 \end{bmatrix} \begin{array}{cl} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & \Delta x & 0 \\ 1 & \Delta x & 0 \\ 0 & -1 & 0 \\ 0 & -1 & 0 \end{bmatrix} & \begin{array}{l} \text{CARD 11.1} \\ \text{CARD 11.2} \\ \text{CARD 11.3} \\ \text{CARD 11.4} \\ \text{CARD 11.5} \\ \text{CARD 11.6} \end{array} \end{array}$$

Shear factors
Bending factors
Torque factors

6.2.5 Card input for GOP = 2. - The card arrangement for the surface/axis data file if GOP = 2 is shown in figure 10. Under this option, each integration is defined on a panel by panel basis. In fact, each card record is directly copied to the unformatted disk file (TAPE 20). For each integration definition, the card sequence - CARD 6, CARD 7, CARD SET 8 - is repeated. Within this sequence, CARD 7 and CARD SET 8 is repeated for each row on the body. The order of the integration definitions is arbitrary. More than one integration may be specified for a particular body. The format is the same for both thin and slender bodies.

After all integrations are specified, any additional loads are defined. The card sequence - CARD 10, CARD SET 11 - is repeated for each additional load definition. Note that CARD 9 is not used in this deck.

6.2.6 Card input for GOP = 3 or 4. - A different card arrangement is used for this option as shown in figure 11. The deck format is essentially the same except that all of the row and panel data cards for a given integration are replaced by a single card which specifies the integration axis. CARD 9A is used for thin bodies and CARD 9B is used for slender bodies. The geometry subroutine will then interface the axis data with the FLEXSTAB GDTAPE and automatically generate the row and panel data. Any additional load definitions follow the integration definitions as before. The disk file created by this option is identical to that for GOP = 2.

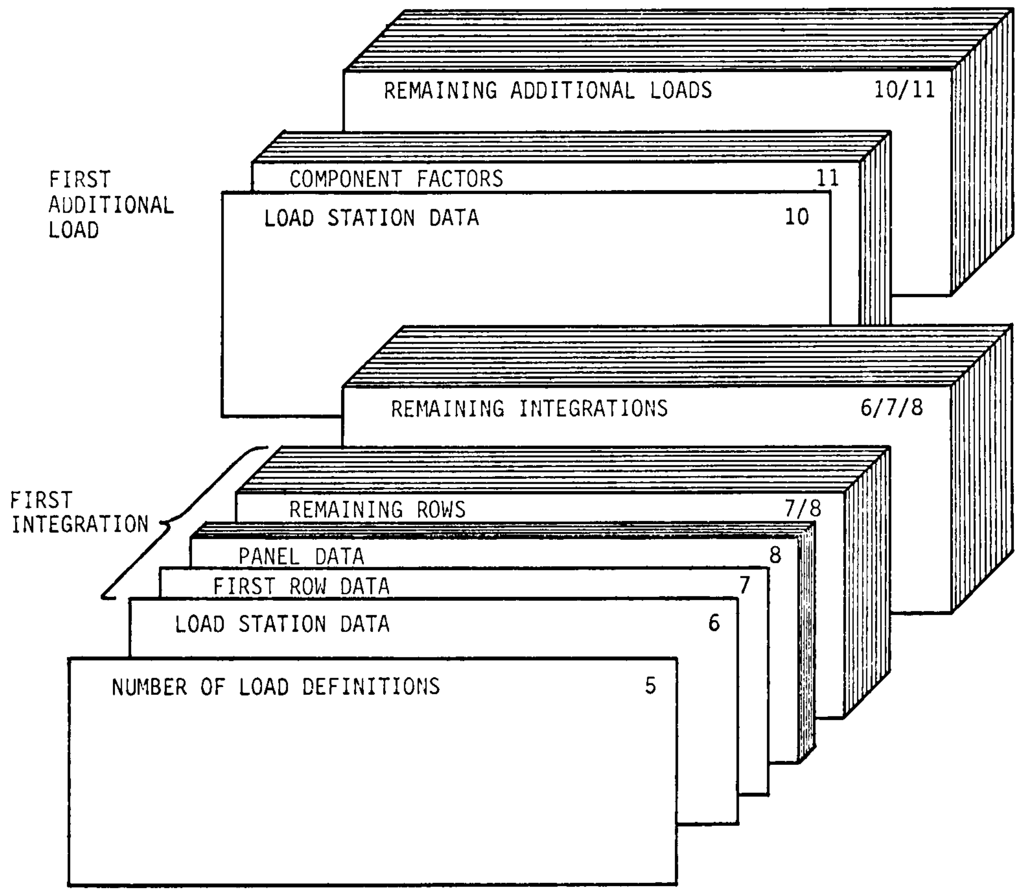

Figure 10. Card arrangement for the surface/axis data file if GOP = 2.

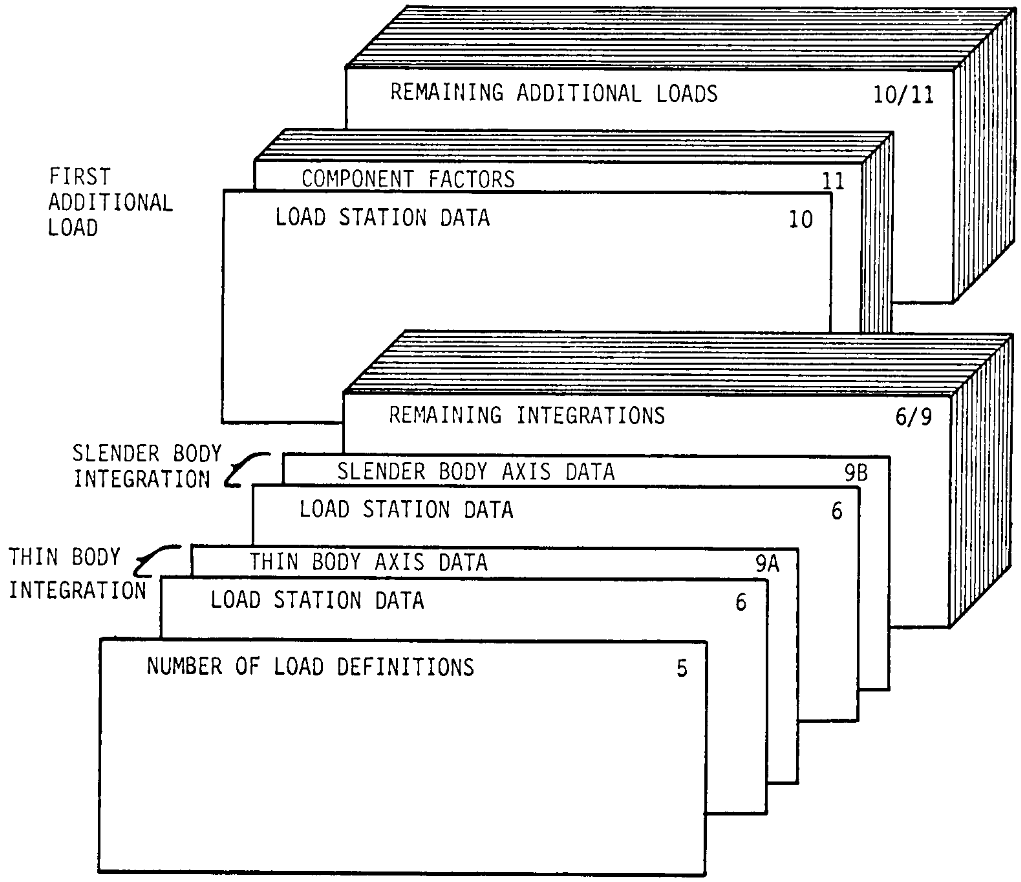

Figure 11. Card arrangement for the surface/axis data file if GOP = 3 or 4.

CARD 5 - NUMBER OF LOAD DEFINITIONS.

If GOP=0 or 1, OMIT this card section and skip to CARD 12.

The total number of load definitions (NSAD+NALD) must not exceed 50.

-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-2	I2	NSAD			X		Number of integrations defined with card sequence 6-7-8 (if GOP=2) or card sequence 6-9 (if GOP=3 or 4).
31-32	I2	NALD			X		Number of additional loads defined with card sequence 10-11.

If GOP=2, the card sequence - CARD 6, CARD 7, CARD SET 8 - is repeated for each integration definition (NSAD times).

If GOP=3 or 4, the card sequence - CARD 6, CARD 9 - is repeated for each integration definition (NSAD times).

CARD 6 - LOAD STATION DATA.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-2	I2	SAN			X		Unique number assigned to this load station (1 to 50).
5-20	4A4	SANAME			X		Name given to this load station.
23-30	2A4	SABODY			X		Name of body associated with this load station. Must match exactly (left justified) with a CPBODY name defined in pressure data files (CARD 22). These are the body names used in the GD program.
33	I1	ITC			X		Integration type code. = 1 : Slender body - vertical load. = 2 : Slender body - lateral load. = 3 : Thin body.
36	I1	SC			X		Symmetry code. = 0 : Body off centerline. = 1 : Body on centerline. (can leave blank if GOP=3 or 4).
39-40	I2	NR			X		Number of rows on body. Always = 1 for slender bodies. (can leave blank if GOP=3 or 4).
41-50	F10.0	SREF			X		Reference area (square feet). Default = 1.0
51-60	F10.0	BREF			X		Reference semispan (bending arm). Default = 1.0 (inches).
61-70	F10.0	CREF			X		Reference chord (torque arm). Default = 1.0 (inches).
71-80	F10.0	CAVG		X			Average chord (inches).

CARD 7 - ROW DATA.

The card sequence - CARD 7, CARD SET 8 - is repeated for each row on the body (NR times- CARD 6).

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-2	I2	RN			X		Row number.
3-10	F8.0	ETA		X			Nondimensional semispan station.
11-20	F10.0	YL		X			Y coordinate in local system of row centroid (inches).
29-30	I2	NP			X		Number of panels in row.
31-40	F10.0	CROW		X			Chord of row at centroid (inches).

CARD SET 8 - PANEL DATA.

Contains NP cards, one card for each panel on row, leading to trailing edge.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-10	2I5	PN			X		Panel index. 1st integer = row number. 2nd integer = panel number.
11-20	F10.0	SP			X		Effective panel area outboard of load station (square inches). If entire panel is inboard of bending axis, set SP = 0.0 .
21-30	F10.0	BARM			X		Effective bending arm of panel (in.).
31-40	F10.0	TARM			X		Effective torque arm of panel (in.) . (positive for effective panel centroid ahead of torque axis).
41-50	F10.0	XCN	X				New value of x/c, nondimensional x coordinate of panel aerocentroid, for repunch option.

CARD 9A - THIN BODY AXIS DATA.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-10	F10.0	XAZ			X		X coordinate in local system of integration axis origin (inches).
11-20	F10.0	YAZ			X		Y coordinate in local system of integration axis origin (inches).
21-30	F10.0	LAD			X		Sweep angle of integration axis (deg).

CARD 9B - SLENDER BODY AXIS DATA.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-10	F10.0	XFWD			X		X coordinate in local system of forward limit of integration (inches).
11-20	F10.0	XAFT			X		X coordinate in local system of aft limit of integration (inches).
21-30	F10.0	XMR			X		X coordinate in local system of moment reference point (inches).
31-40	F10.0	MRC			X		Moment reference sign convention. = 1.0 : Positive nose up or to right. = -1.0 : Positive tail up or to right.

The card sequence - CARD 10, CARD SET 11 - is repeated for each additional load definition (NALD times - CARD 5).

CARD 10 - LOAD STATION DATA.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-2	I2	SAN			X		Unique number assigned to this load station (1 to 50).
5-20	4A4	SANAME			X		Name given to this load station.
33	I1	ITC			X		Integration type code. = 4 : Additional load.
36	I1	SC			X		Symmetry code. = 0 : Load station off centerline. = 1 : Load station on centerline.
38-40	I3	NT			X		Number of component loads defined with CARD SET 11.
41-50	F10.0	SREF			X		Reference area (square feet). Default = 1.0
51-60	F10.0	BREF			X		Reference semispan (bending arm). Default = 1.0 (inches)
61-70	F10.0	CREF			X		Reference chord (torque arm). Default = 1.0 (inches)

CARD SET 11 - COMPONENT FACTORS.

Repeated NT times - CARD 10.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-2	I2	CN			X		Load station number (SAN) of this component (1 to 50). If CN = 0, VFAC, BFAC, and TFAC contain simple constants added to additional load. Leave CL,CT blank.
6	I1	CL			X		Component location. = 1 : Left side. = 2 : Right side. = 3 : Centerline.
10	I1	CT			X		Component type. = 1 : Shear load. = 2 : Bending load. = 3 : Torque load.
11-20	F10.3	VFAC			X		Shear factor for this component.
21-30	F10.3	BFAC			X		Bending factor for this component.
31-40	F10.3	TFAC			X		Torque factor for this component.

NOTE : If SC=0 (on CARD 10), define the left hand components only. Both left hand and right hand loads will be computed automatically.

If SC=1 (on CARD 10), additional load station is on centerline which means left hand, right hand, and centerline loads can be specified as components.

If the geometry input option is the only option requested (POP=ROP=SOP=IOP=WOP=0), the remaining CARDS 12-24 are <u>omitted</u>

6.3 Wind Tunnel Data File (CARDS 12-15)

The card arrangement for the wind tunnel data file is shown in figure 12. These cards are included only if WOP = 2 on CARD 1. The card sequence - CARD 13, CARD SET 14 - is repeated for each of 6 possible load stations. Any station that is not applicable to the configuration is simply omitted. For each station, CARD SET 14 contains 15 cards which define the airload coefficients as specified in tables 3 thru 7. Two separate sets of coefficients can be entered for the vertical tail.

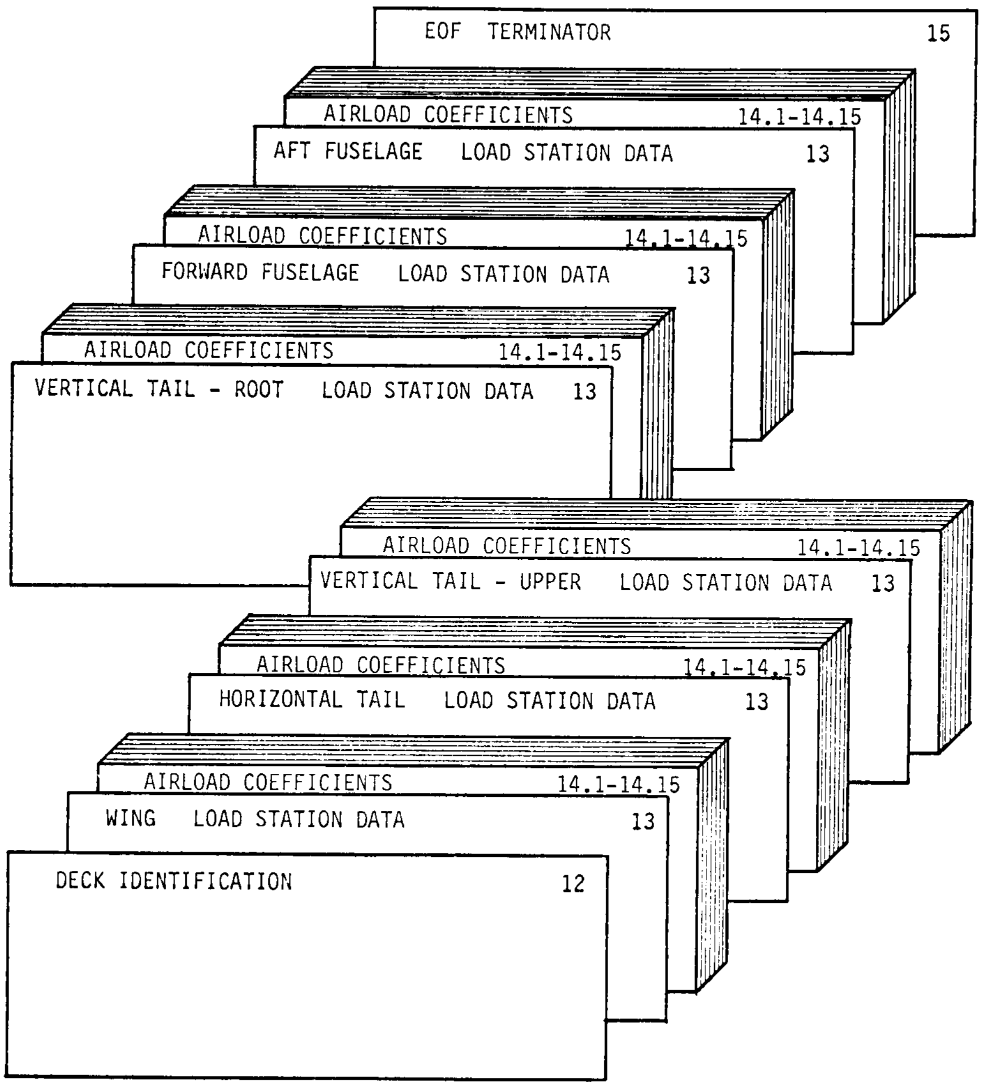

Figure 12. Card arrangement for the wind tunnel data file.

If WOP=0 or 1 , OMIT this card section and skip to CARD SET 16.

CARD 12 - DECK IDENTIFICATION.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-72	18A4	WID				X	Wind tunnel deck identification. (Alpha-numeric)

The card sequence - CARD 13, CARD SET 14 is repeated for each of the 6 possible load stations to be defined.

CARD 13 - LOAD STATION DATA.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-2	I2	WTN				X	Load station number. = 1 : Wing. = 2 : Horizontal tail. = 3 : Vertical tail - upper. = 4 : Vertical tail - root. = 5 : Forward fuselage. = 6 : Aft fuselage.
5-20	4A4	WTNAME				X	Name given to this load station.
21-30	F10.0	SWT				X	Reference area (square feet).
31-40	F10.0	BWT				X	Reference semispan (inches).
41-50	F10.0	CWT				X	Reference chord (inches).
53-59	F7.0	XHT				X	Horizontal tail, longitudinal moment transfer arm (inches). (Δx between horizontal tail and aft fuselage load stations)
60-66	F7.0	YHT				X	Horizontal tail, lateral moment transfer arm (inches). (Δy between horizontal tail and aft fuselage load stations)
67-73	F7.0	XVT				X	Vertical tail root, longitudinal moment transfer arm (inches). (Δx between vertical tail root and aft fuselage load stations)
74-80	F7.0	ZVT				X	Vertical tail root, vertical moment transfer arm (inches). (Δz between vertical tail root and aft fuselage load stations)

NOTE : XHT, YHT, XVT, and ZVT are defined for the aft fuselage load station only (WTN=6). Refer to equations 16, 18, and 19. Leave blank for other load stations.

CARD SET 14 - AIRLOAD COEFFICIENTS.

Contains 15 cards as specified in : Table 3 - Wing station
Table 4 - Horizontal tail station
Table 5 - Vertical tail
Table 6 - Forward fuselage station
Table 7 - Aft fuselage station

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
6-10	I5	NSEQ				X	Component sequence number. (See tables)
11-20	E10.2	CV				X	Shear coefficient for this component effect.
21-30	E10.2	CB				X	Bending coefficient for this component effect.
31-40	E10.2	CT				X	Torque coefficient for this component effect.
43-63	3A7	DES				X	Descriptive name (Alpha-numeric) of this component effect. (See tables)
64-80	Not read	-				X	These columns are available to the user for a deck ID.

TABLE 3. AIRLOAD COEFFICIENTS FOR WING STATION

WTN=1 Refer to equation 8.

CARD	NSEQ	DES (Component effect)
14.1	101	ALPHA = 0
14.2	102	ALPHA
14.3	103	ALPHA DOT
14.4	104	DELTA SPOILER
14.5	105	ROLL DAMPING, P
14.6	106	PITCH DAMPING, Q
14.7	107	BETA, ALPHA=0, A/S
14.8	108	BETA*ALPHA, A/S
14.9	109	BETA, ALPHA=0, SYM
14.10	110	BETA*ALPHA, SYM
14.11	111	BLANK FILLER,NOT USED
14.12	112	BLANK FILLER,NOT USED
14.13	113	BLANK FILLER,NOT USED
14.14	114	BLANK FILLER,NOT USED
14.15	115	BLANK FILLER,NOT USED

TABLE 4. AIRLOAD COEFFICIENTS FOR HORIZONTAL TAIL STATION

WTN=2 Refer to equation 9.

CARD	NSEQ	DES (Component effect)
14.1	201	ALPHA = 0
14.2	202	ALPHA
14.3	203	DELTA H
14.4	204	ALPHA DOT
14.5	205	BETA
14.6	206	DELTA H PRIME
14.7	207	DELTA SPOILER
14.8	208	DELTA SPOILER C/O
14.9	209	ROLL DAMPING, P
14.10	210	PITCH DAMPING, Q
14.11	211	BLANK FILLER,NOT USED
14.12	212	BLANK FILLER,NOT USED
14.13	213	BLANK FILLER,NOT USED
14.14	214	BLANK FILLER,NOT USED
14.15	215	BLANK FILLER,NOT USED

TABLE 5. AIRLOAD COEFFICIENTS FOR UPPER VERTICAL TAIL STATION

WTN=3 Refer to equation 10.

CARD	NSEQ	DES (Component effect)
14.1	301	BETA, ALPHA=0
14.2	302	BETA* ALPHA
14.3	303	DELTA H PRIME
14.4	304	DELTA SPOILER
14.5	305	DELTA RUDDER, UPPER
14.6	306	DELTA RUDDER, LOWER
14.7	307	ROLL DAMPING, P
14.8	308	YAW DAMPING, R
14.9	309	BLANK FILLER,NOT USED
14.10	310	BLANK FILLER,NOT USED
14.11	311	BLANK FILLER,NOT USED
14.12	312	BLANK FILLER,NOT USED
14.13	313	BLANK FILLER,NOT USED
14.14	314	BLANK FILLER,NOT USED
14.15	315	BLANK FILLER,NOT USED

Airload coefficients for the vertical tail root station are input using the same format as TABLE 5 with NSEQ numbers in 400 series. Vertical tail root loads should be defined if tail induced lateral loads at the aft fuselage station are to be computed.

TABLE 6. AIRLOAD COEFFICIENTS FOR FORWARD FUSELAGE STATION

WTN=5 Refer to equations 11&12

CARD	NSEQ	DES (Component effect)
14.1	501	ALPHA=0 (VERTICAL)
14.2	502	ALPHA (VERTICAL)
14.3	503	ROLL DAMP, P (LAT)
14.4	504	BETA (LATERAL)
14.5	505	BLANK FILLER,NOT USED
14.6	506	BLANK FILLER,NOT USED
14.7	507	BLANK FILLER,NOT USED
14.8	508	BLANK FILLER,NOT USED
14.9	509	BLANK FILLER,NOT USED
14.10	510	BLANK FILLER,NOT USED
14.11	511	BLANK FILLER,NOT USED
14.12	512	BLANK FILLER,NOT USED
14.13	513	BLANK FILLER,NOT USED
14.14	514	BLANK FILLER,NOT USED
14.15	515	BLANK FILLER,NOT USED

TABLE 7. AIRLOAD COEFFICIENTS FOR AFT FUSELAGE STATION

WTN=6 Refer to equations 13&14

CARD	NSEQ	DES (Component effect)
14.1	601	ALPHA=0 (VERTICAL)
14.2	602	ALPHA (VERTICAL)
14.3	603	BETA,ALPHA=0,C/O(LAT)
14.4	604	BETA*ALPHA,C/O (LAT)
14.5	605	DELTA H PRIME (LAT)
14.6	606	DELTA RUD, LOWER(LAT)
14.7	607	ROLL DAMPING, P (LAT)
14.8	608	BETA (LATERAL)
14.9	609	BLANK FILLER,NOT USED
14.10	610	BLANK FILLER,NOT USED
14,11	611	BLANK FILLER,NOT USED
14.12	612	BLANK FILLER,NOT USED
14.13	613	BLANK FILLER,NOT USED
14.14	614	BLANK FILLER,NOT USED
14.15	615	BLANK FILLER,NOT USED

CARD 15 - EOF TERMINATOR.

Terminates wind tunnel data file.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1	-	EOF				X	7-8-9 multipunch.

6.4 Case Description Data (CARDS 16-18)

The card arrangement for the case description data is shown in figure 13. CARD SET 16 defines aerodynamic parameters (α,β, etc.) describing each specific case to be processed. It is required for execution of the wind tunnel option (WOP = 1 or 2). For the integration option, it provides printout header information only, and is optional. (Alpha, beta, and Qbar values only are obtained from the pressure data files for the integration option.) CARD SET 16 contains one card for each parameter to be defined for each case. However, to minimize the card count, an automatic recycle feature is incorporated that works as follows: All parameter values for case 1 are initially defaulted to zero. The user defines any non-zero parameters. These values are automatically used for each succeeding case until reset with an additional card defining the new value. A simple example is included after the card descriptions at the end of this section.

CARD 17 serves as an EOF terminator for CARD SET 16. It is always included even if CARD SET 16 is omitted. CARD 18 controls the number of cases processed for the pressure data, integration, and wind tunnel options.

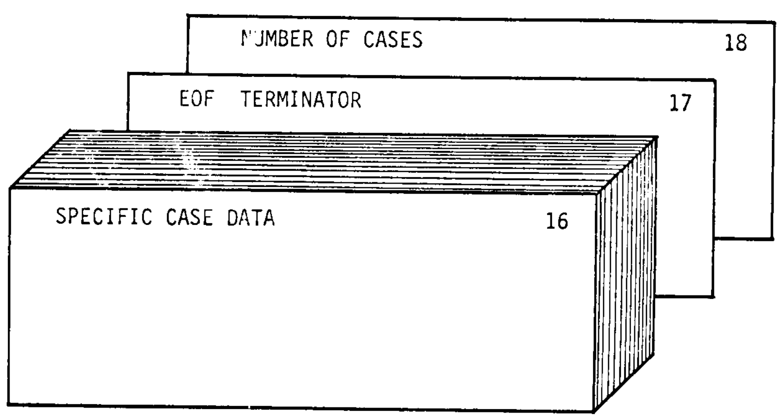

Figure 13. Card arrangement for the case description data.

If POP=0 AND WOP=0, OMIT this card section.

CARD SET 16 - SPECIFIC CASE DATA.

Required for wind tunnel option.
Optional for integration option.

This card set incorporates an automatic recycle feature. Only non-zero value parameters need be defined and/or thereafter only if they change for a succeeding case. Order does not matter as long as the case number for any specific parameter always increases. The use of this card set is clarified in the example after CARD 18.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1	I1	CI	I	I	I	X	Case index (1-9).
5-6	I2	PI	I	I	I	X	Parameter index. = 1 : Angle of attack (deg). = 2 : Angle of sideslip (deg). = 3 : Dynamic pressure (psf). = 4 : True airspeed (ft/sec). = 5 : Alpha dot (deg/sec). = 6 : CNA-airplane normal force coeff. = 7 : Roll rate (deg/sec). = 8 : Pitch rate (deg/sec). = 9 : Yaw rate (deg/sec). =10 : Not used- =11 : Not used. =12 : Not used. =13 : Aileron deflection, δh' (deg). =14 : Elevator deflection, δh (deg). =15 : Upper rudder deflection (deg). =16 : Lower rudder deflection (deg). =17 : Left spoiler deflection (deg). =18 : Right spoiler deflection (deg). =19 : Not used. =20 : Not used.
10-19	F10.0	PV	I	I	I	X	Parameter value for this case.

CARD 17 - EOF TERMINATOR.

This card terminates CARD SET 16 and is included even if CARD SET 16 is omitted.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1	-	EOF	X	X	X	X	7-8-9 multipunch.

CARD 18 - NUMBER OF CASES

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1	I1	NC	X	X	X	X	Number of cases in this run (1-9). Note that if a decimal point is added in column 2, this card can be used with the pressure data files (CARDS 19-24) to execute the FLEXSTAB PDPLOT program (Level 1.02 only).

Example for the case description data -

Assume the following 4 parameters are to be defined for 4 cases to be processed by the wind tunnel option :

Case 1 : Qbar=1000 , α=0 , β=0 , δh=0

Case 2 : Qbar=1000 , α=5 , β=0 , δh=0

Case 3 : Qbar=1000 , α=0 , β=0 , δh=-5

Case 4 : Qbar= 500 , α=0 , β=5 , δh=0

CARD SECTION 16-18 would consist of the following cards :

CARD	CI	PI	PV	
16.1	1	03	1000.	Qbar, cases 1-3
16.2	4	03	500.	Qbar, case 4
16.3	2	01	5.	α, case 2 (case 1 defaults to 0)
16.4	3	01	0.	α, cases 3-4
16.5	4	02	5.	β, case 4
16.6	3	14	-5.	δh, case 3 (cases 1-3 default to 0)
16.7	4	14	0.	δh, case 4
17	7/8/9			EOF
18	4.			Number of cases

Note that if the integration option were executed without the wind tunnel option, CARD SET 16 would contain CARDS 16.6 and 16.7 only. Alpha, Beta, and Qbar values would be obtained directly from the pressure data files.

6.5 Pressure Data Files (CARDS 19-24)

This card section is for the creation of the pressure data files. If POP = 0 or 2, these cards are omitted. This entire card section is normally punched by the FLEXSTAB SD&SS program (references 2-4). Current versions of FLEXSTAB punch only thin body pressures, but slender body force coefficients can be manually added to the deck punched by FLEXSTAB.

The card arrangement is shown in figure 14. CARDS 19, 20 and 21 are identification and control data. The card sequence -CARD 22, CARD 23, CARD SET 24- is repeated for each thin body. Within this sequence, CARD 23, CARD SET 24 is repeated for each row on the body. Any slender bodies are added to

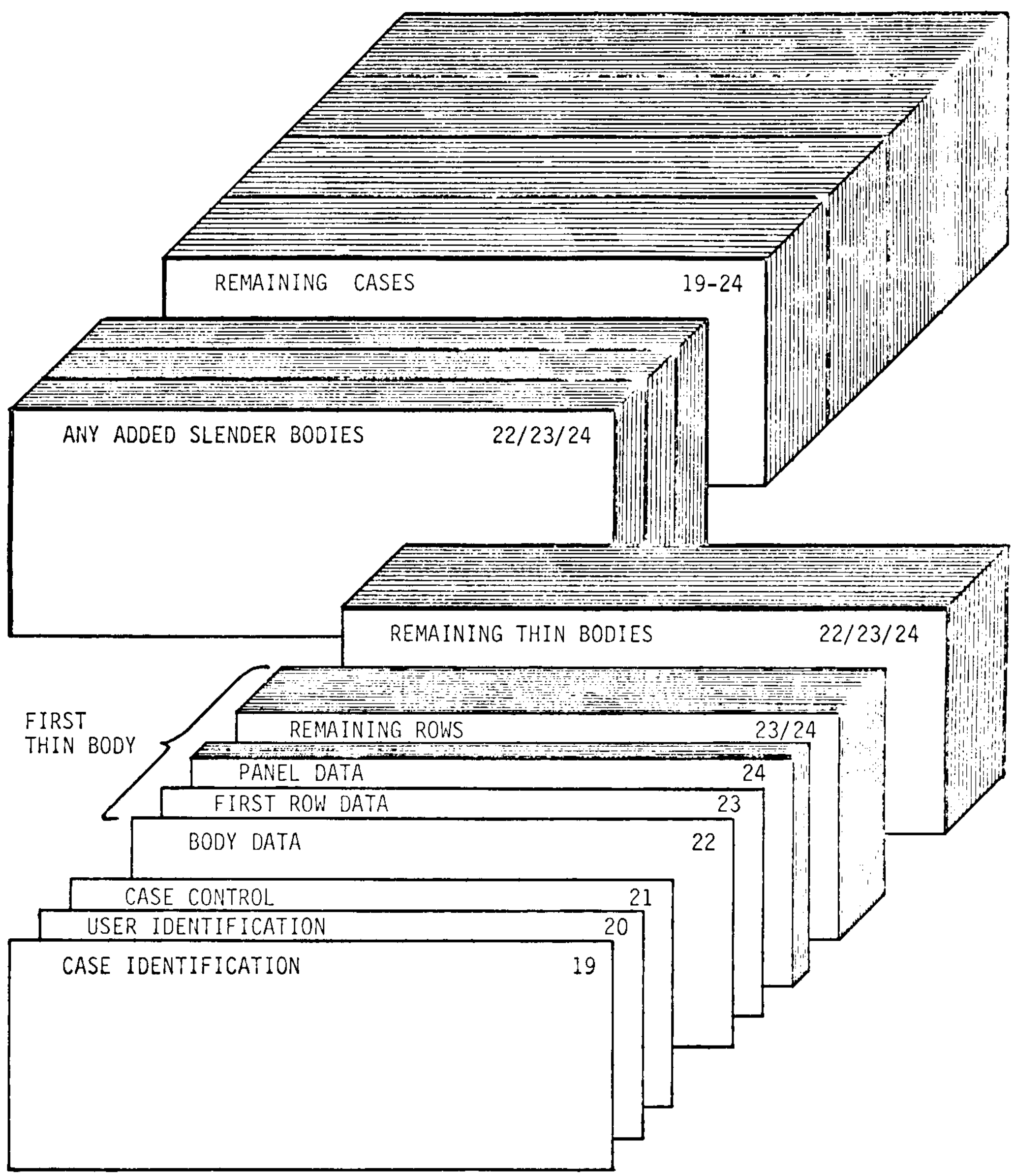

Figure 14. Card arrangement for the pressure data files.

the deck using the same format as for thin bodies. (The slender body data is analogous to a thin body with one row.) If any slender bodies are added, the number of bodies entered on CARD 21 must be changed to reflect the total number of bodies now in the deck.

The entire card sequence 19-24 is repeated for any additional cases. It is important to note that the pressure decks punched by FLEXSTAB contain a "STEADY PRESSURE DISTRIBUTION" header card at the beginning of each case. These header cards must be discarded from each case for execution in both this program and the FLEXSTAB PDPLOT program.

If POP=0 or 2 , OMIT this card section.

CARD 19 - CASE IDENTIFICATION.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-72	18A4	CID	X	X	X		Case title. This title card is the same as input to the SD&SS program. It is printed as part of the page header for the repunch, section, integration, and summary print options.

CARD 20 - USER IDENTIFICATION.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-72	18A4	UID	X	X	X		User subtitle.

CARD 21 - CASE CONTROL.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-10	F10.4	NTB	X	X	X		Number of thin bodies PLUS any slender bodies manually added to this case.
11-20	F10.4	MR	X	X	X		Motion reference. = 1.0 : Symmetric motion. = 2.0 : Asymmetric motion.
21-30	F10.4	M1	X	I	I		Mach number.
31-40	F10.4	A1	X	I	I		Angle of attack (deg).
41-50	F10.4	B1	X	I	I		Angle of sideslip (deg).
51-60	F10.4	Q1	X	X	X		Dynamic pressure (psf).

The card sequence - CARD 22, CARD 23, CARD SET 24 - is repeated for each body in this case (NTB times).

CARD 22 - BODY DATA.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-8	2A4	CPBODY	X	X	X		Name of body (from GD program).
11-20	F10.4	NAF	X	X	X		Number of rows on body. (always equals 1 for slender bodies)
21-30	F10.4	THETA	X	I	I		Dihedral angle of thin body (deg). (blank or zero for slender bodies)

The card sequence - CARD 23, CARD SET 24 - is repeated for each row on the body (NAF times).

CARD 23 - ROW DATA.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-10	F10.4	YR	X				Y coordinate in Reference system of row centroid (inches).
11-20	F10.4	NPT	X	X	X		Number of panels in row.

CARD SET 24 - PANEL DATA.

Contains NPT cards, one card for each panel on row, leading to trailing edge.

C-C	FORMAT	DESCRIPTOR	R	S	I	W	EXPLANATION
1-10	F10.4	XC					X/C , nondimensional x coordinate of aerocentroid.
11-20	F10.4	CPS	X	X	X		Pressure coefficient (ΔCP) due to symmetric motion. For thin bodies: If MR=1.0=symmetric motion, CPS is used for both left and right hand surfaces, so that CPR and CPL need not be defined.(CPS=CPR=CPL) For slender bodies: CPS is the vertical force coefficient (DELTA CP(ZM) from the SD&SS printout). Applies to left and right hand or centerline bodies.
21-30	F10.4	CPR	X	X	X		Pressure coefficient for the right hand surface aerocentroid.
31-40	F10.4	CPL	X	X	X		Pressure coefficient for the left hand surface aerocentroid. For thin bodies: If MR=2.0=asymmetric motion, CPR≠CPL≠CPS. Note that for a positive sideslip (nose left), FLEX STAB sign conventions for a vertical tail on the centerline (THETA=+90) result in CPR being positive and CPL= -CPR. Thus only CPL is used to compute loads so that a positive side-slip produces a negative vertical tail load. For slender bodies: CPR is the lateral force coefficient, DELTA CP(YM), on the right hand OR centerline body. CPL is the lateral force coefficient on the left hand slender body.
41-50	F10.4	XR	X				X coordinate in Reference system of aerocentroid (inches).

7.0 OUTPUT DESCRIPTION

Output from FSLIP consists of line printer listings, punched cards, and disk permanent files as described in section 4.2. Each of these is briefly outlined below along with equations for estimating the amount of printed or punched output.

7.1 Printed Output

Printed output is produced by 4 of the major program options as described below. Specific details of the printed output are not presented here as the printout makes generous use of headers and descriptors. See section 8.0 for example output listings.

7.1.1 Geometry option.- If GOP = 3 or 4, the surface/axis data file is created by using the FLEXSTAB GDTAPE. A printout is generated which lists complete details of each integration definition including effective areas and arms computed for each panel on the specified body. Any panels cut by the bending axis are flagged. Total panel area outboard of the bending axis is also listed. Details of any additional load definitions are printed out. An example of these listings is shown in section 8.1. The amount of output can be estimated from the following equation:

Number of pages = 1.5 * NSAD + NALD + 1
where NSAD and NALD are as specified on CARD 5

7.1.2 Integration option.- If IOP = 1, a printout is generated for each integration definition set true on CARD 2A. The listing includes a panel by panel description of the integration process. After all integrations are performed, any additional load definitions are listed. The printout is then repeated for any succeeding cases. Section 8.2 contains an example of this printout. If IOP = 2, this printout is suppressed. The amount of output can be estimated from the following equation:

Number of pages = (1.5 * NSAD + NALD + 1) * NC
where NSAD and NALD are now the number of integrations and additional loads set true on CARD 2A and NC is the number of cases specified on CARD 18.

7.1.3 Wind tunnel option.- A printout is generated for each load station showing the component loads due to each aerodynamic effect. An example is shown in section 8.2. The amount of output varies from 1 to 5 pages per case depending on which stations are set true on CARD 2B. The 5 stations consist of wing, horizontal tail, vertical tail, forward fuselage, and aft fuselage.

7.1.4 Summary print option.- This option produces a concise summary of the total loads and coefficients for each specified load station for all cases processed. If IOP = 2, this option must be used to print the total integrated loads. The amount of output consists of 1 page per load station specified with CARD 3.

7.2 Punched Output

The only punched card output is produced by the GOP = 4 option. It consists of a complete surface/axis data file which may be input using GOP = 2. The format of the punched deck is described in section 6.2. The number of punched cards can be estimated from the following equations:

For each integration defined with CARD 6:

Number of cards = NR + NP + 1
where NR = number of rows on body
NP = number of panels on body

For each additional load specified with CARD 10:

Number of cards = NT + 1
where NT = number of terms (CARD 10)

7.3 Disk File Output

Disk files produced by FSLIP consist of the pressure data files (TAPE 11 to 19), the surface/axis data file (TAPE 20), and the wind tunnel data file (TAPE 40). The detailed format of these files is not presented as they are a direct one-for-one unformatted copy of each card record. Thus the user is referred to sections 6.2, 6.3, and 6.5 for details of the file formats.

8.0 EXAMPLE PROBLEMS

This section includes 3 example problems which illustrate the major program options and suggested job sequencing. Section 8.1 presents an example of creating the integration geometry data base using the FLEXSTAB GDTAPE for input. Section 8.2 is an example which creates a revised geometry data base and wind tunnel coefficient data base from card input and then executes the integration and wind tunnel loads options. Section 8.3 is an example which executes the integration option only using previously created data bases with minimum input/output. All three examples are based on runs from the airloads research study being conducted on the B-1 aircraft. Each section includes a brief discussion followed by listings of the card input and program printouts.

8.1 Geometry Option Only

This example represents what would normally be the first job executed through FSLIP. The only option exercised is GOP = 4 which will punch the integration geometry for the B-1 airload measurement stations as defined in figure 15. Figure 16 shows the equivalent FLEXSTAB GD model which is composed of 7 thin bodies and 1 slender body. Note that the wing and vertical tail are both split into 2 separate thin bodies.

Integration axes are shown at the 8 load stations which were arbitrarily assigned surface/axis numbers 1 through 8. Separate vertical and lateral integrations are defined for the forward and aft fuselage stations. The additional loads option is used to define 3 new loads (surface/axis numbers 31-33) for computing total aft fuselage loads. First, the two vertical tail stations are summed to get the total vertical tail root loads. Second, the horizontal tail components are added to the aft fuselage to get total vertical loads at the aft fuselage station. Third, vertical tail root and horizontal tail components are added to the aft fuselage to get total lateral loads at the aft fuselage station.

Note that the wing integration applies to WING2 only. The geometry subroutine will compute effective areas for all panels outboard of the X_A axis, but it was desired to neglect the area of the two shaded panels to account for the nacelle and fairings. For this reason, the punched deck from this job must be modified and resubmitted with GOP = 2 as shown in the next example.

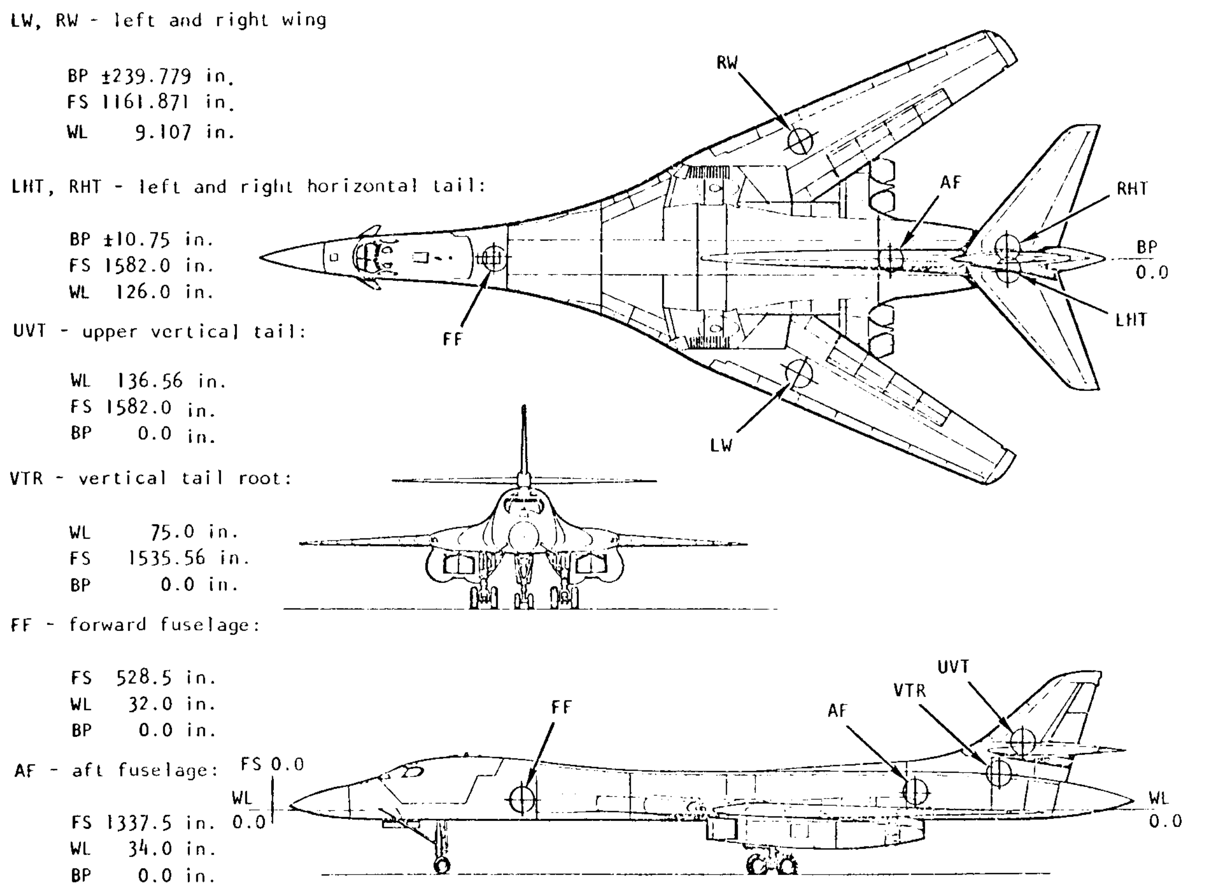

Figure 15. B-1 airload measurement stations.

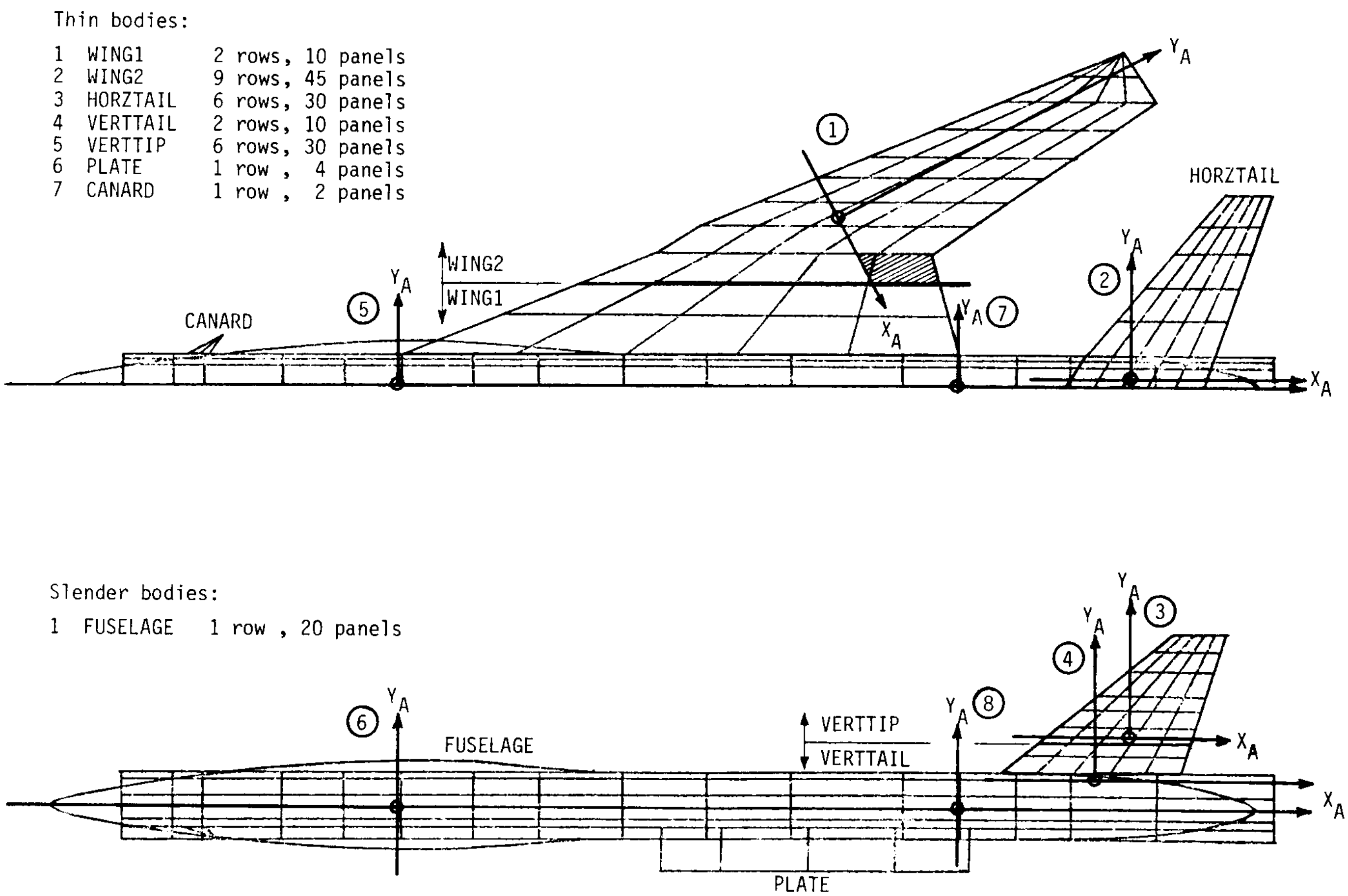

Figure 16. FLEXSTAB aerodynamic model of the B-1.

Card input listing for example 8.1

```
CARD             1         2         3         4         5         6         7         8
 NO     12345678901234567890123456789012345678901234567890123456789012345678901234567890

 1          GOP 4       POP 0       POP 0       SDP 0      IOP 0      WLP 0
 2                           SUMMARY PRINT TERMINATOR
 3     08    NSAD                           03    NALD
 4     1   WING - SG AXIS      WING2        3   0    9    1946.00     820.08     184.05     170.85
 5       1161.87       239.92      63.52
 6     2   HORIZ TAIL - SG     HORZTAIL     3   0    6     238.77     259.03     149.38     132.74
 7       1582.00       10.75        0.00
 8     3   VERT TAIL - SG      VERTTIP      3   1    6     247.40     206.76     188.95     172.30
 9       1582.00      136.50        0.00
10     4   VERT TAIL - ROOT    VERTTAIL     3   1    2     247.40     206.76     188.95     172.30
11       1535.56       75.00        0.00
12     5   FWD FUS SG VERT     FUSELAGE     1   1    1    1946.00     820.08     184.05
13          0.00      528.50      528.50        1.00
14     6   FWD FUS SG LAT      FUSELAGE     2   1    1    1946.00     820.08     184.05
15          0.00      528.50      528.50        1.00
16     7   AFT FUS SG VERT     FUSELAGE     1   1    1    1946.00     820.08     184.05
17       1337.50     1800.00     1337.50       -1.00
18     8   AFT FUS SG LAT      FUSELAGE     2   1    1    1946.00     820.08     184.05
19       1337.50     1800.00     1337.50       -1.00
20    31   VT ROOT TOTAL                    4   1    6     247.40     206.76     188.95
21    03    3    1        1.00       61.56     -46.44
22    03    3    2        0.00        1.00       0.00
23    03    3    3        0.00        0.00       1.00
24    04    3    1        1.00        0.00       0.00
25    04    3    2        0.00        1.00       0.00
26    04    3    3        0.00        0.00       1.00
27    32   AFT FUS SG V-TOT                 4   1    6    1946.00     820.08     184.05
28    32    3    1        1.00        0.00       0.00
29    32    3    2        0.00        1.00       0.00
30    32    1    1        1.00      244.50       0.00
31    32    2    1        1.00      244.50       0.00
32    32    1    3        0.00       -1.00       0.00
33    32    2    3        0.00       -1.00       0.00
34    33   AFT FUS SG L-TOT                 4   1   10    1946.00     820.08     184.05
35    08    3    1        1.00        0.00       0.00
36    08    3    2        0.00        1.00       0.00
37    08    3    3        0.00        0.00       1.00
38    31    3    1        1.00      198.06      41.00
39    31    3    2        0.00        0.00       1.00
40    31    3    3        0.00       -1.00       0.00
41    02    1    1        0.00        0.00      10.75
42    02    2    1        0.00        0.00     -10.75
43    02    1    2        0.00        0.00       1.00
44    02    2    2        0.00        0.00      -1.00
```

Program output listing for example 8.1

```
GEOMETRY OPTION = 4

 8  SURFACE/AXIS DEFINITIONS TO BE COMPUTED  AND PUNCHED

    USING FLEXSTAB GDTAPE ,   FILE  1

CASE ID =   B1 ARS   GD-2C....67.5WS
::

USER ID =   NASA/DFRC   BOB STMS   EXT 308
::

UNITS OPTION =   INCH




 3  ADDITIONAL LOADS TO BE DEFINED
```

SURFACE/AXIS NUMBER = 1 SURFACE/AXIS NAME = WING - SG AXIS GD BODY NAME = WING2

INTEGRATION TYPE CODE = 3 SREF = 1946.000 BREF = 820.080 CREF = 184.050

BODY TYPE CODE = 3 SYMMETRY CODE = OFF

NUMBER OF ROWS = 9 THETA = -1.94 DEG

INTEGRATION AXIS DEFINITION

ORIGIN AT XN = 1161.670
YN = 239.920
SWEEP ANGLE = 63.520 DEG

ROW DATA

NUMBER	YN	NUMBER OF PANELS
1	166.023	5
2	208.430	5
3	245.245	5
4	280.220	5
5	312.775	5
6	347.552	5
7	387.246	5
8	423.704	5
9	456.000	5

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN	
1	1	0.000	0.000	0.000	
1	2	0.000	0.000	0.000	
1	3	0.000	0.000	0.000	
1	4	614.071	9.239	-76.261	CUT PANEL
1	5	4043.684	53.207	-149.024	CUT PANEL
2	1	0.000	0.000	0.000	
2	2	0.000	0.000	0.000	
2	3	240.559	9.391	-23.688	CUT PANEL
2	4	2499.882	37.166	-50.712	CUT PANEL
2	5	3078.947	98.103	-84.051	
3	1	0.000	0.000	0.000	
3	2	348.747	12.541	13.358	CUT PANEL
3	3	2189.756	39.651	-11.371	CUT PANEL
3	4	2618.773	97.892	-42.815	
3	5	2619.773	164.907	-76.199	

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN	
4	1	792.891	19.598	46.131	CUT PANEL
4	2	2229.513	50.026	21.195	CUT PANEL
4	3	2389.686	107.243	-8.399	
4	4	2389.686	168.404	-38.866	
4	5	2389.686	229.565	-69.333	
5	1	1865.969	60.901	48.067	
5	2	1865.969	122.612	20.315	
5	3	1865.969	178.323	-7.438	
5	4	1865.969	234.035	-35.190	
5	5	1865.969	289.746	-62.942	
6	1	2226.145	154.478	43.295	
6	2	2226.145	204.368	18.442	
6	3	2226.145	254.258	-6.411	
6	4	2226.145	304.148	-31.263	
6	5	2226.145	354.038	-56.116	
7	1	1904.691	254.436	37.847	
7	2	1904.691	297.681	16.304	
7	3	1904.691	340.927	-5.238	
7	4	1904.691	384.173	-26.781	
7	5	1904.691	427.418	-48.324	
8	1	1216.113	343.147	34.387	
8	2	1216.113	374.094	18.970	
8	3	1216.113	405.042	3.554	
8	4	1216.113	435.990	-11.863	
8	5	1216.113	466.936	-27.279	
9	1	397.976	418.302	33.030	
9	2	397.976	431.496	26.458	
9	3	397.976	444.689	19.886	
9	4	397.976	457.883	13.313	
9	5	397.976	471.076	6.741	

TOTAL AREA 66499.123

SURFACE/AXIS NUMBER = 2   SURFACE/AXIS NAME = HORIZ TAIL - SG   GD BODY NAME = HORZTAIL

INTEGRATION TYPE CODE = 3   SREF = 238.770   BREF = 259.030   CREF = 149.380

BODY TYPE CODE = 3   SYMMETRY CODE = OFF

NUMBER OF ROWS = 6   THETA = 1.00 DEG

INTEGRATION AXIS DEFINITION   ORIGIN AT XN = 1582.000
YN = 10.750
SWEEP ANGLE = 0.000 DEG

ROW DATA

NUMBER	YN	NUMBER OF PANELS
1	21.506	5
2	68.120	5
3	116.862	5
4	164.204	5
5	207.859	5
6	249.416	5

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN	
1	1	1263.184	16.236	54.720	CUT PANEL
1	2	1263.184	16.236	16.141	CUT PANEL
1	3	1263.184	16.236	-22.438	CUT PANEL
1	4	1263.184	16.236	-61.017	CUT PANEL
1	5	1263.184	16.236	-99.595	CUT PANEL
2	1	1765.972	57.370	23.705	
2	2	1765.972	57.370	-11.330	
2	3	1765.972	57.370	-46.365	
2	4	1765.972	57.370	-81.400	
2	5	1765.972	57.370	-116.435	
3	1	1406.099	106.112	-16.883	
3	2	1406.099	106.112	-46.866	
3	3	1406.099	106.112	-76.849	
3	4	1406.099	106.112	-106.832	
3	5	1406.099	106.112	-136.815	
4	1	1199.702	153.454	-56.304	
4	2	1199.702	153.454	-81.381	
4	3	1199.702	153.454	-106.457	
4	4	1199.702	153.454	-131.533	
4	5	1199.702	153.454	-156.610	

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN
5	1	798.922	197.109	-92.656
5	2	798.922	197.109	-113.208
5	3	798.922	197.109	-133.760
5	4	798.922	197.109	-154.311
5	5	798.922	197.109	-174.863
6	1	725.942	238.666	-127.261
6	2	725.942	238.666	-143.506
6	3	725.942	238.666	-159.750
6	4	725.942	238.666	-175.994
6	5	725.942	238.666	-192.239

TOTAL AREA 35799.106

SURFACE/AXIS NUMBER = 3   SURFACE/AXIS NAME = VERT TAIL - SG   GD BODY NAME = VERTTIP

INTEGRATION TYPE CODE = 3   SREF = 247.400   BREF = 206.760   CREF = 188.950

BODY TYPE CODE = 3   SYMMETRY CODE = CN

NUMBER OF ROWS = 6   THETA = 90.00 DEG

INTEGRATION AXIS DEFINITION   ORIGIN AT XN = 1582.000
YN = 136.560
SWEEP ANGLE = 0.000 DEG

ROW DATA

NUMBER	YN	NUMBER OF PANELS
1	137.790	5
2	162.245	5
3	184.576	5
4	210.878	5
5	242.432	5
6	269.123	5

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN	
1	1	553.150	6.653	90.303	CUT PANEL
1	2	553.150	6.653	49.133	CUT PANEL
1	3	553.150	6.653	7.964	CUT PANEL
1	4	553.150	6.653	-33.206	CUT PANEL
1	5	553.150	6.653	-74.375	CUT PANEL
2	1	940.289	25.685	68.034	
2	2	940.289	25.685	30.376	
2	3	940.289	25.685	-7.263	
2	4	940.289	25.685	-44.942	
2	5	940.289	25.685	-82.600	
3	1	653.390	48.016	41.906	
3	2	653.390	48.016	8.366	
3	3	653.390	48.016	-25.173	
3	4	653.390	48.016	-58.712	
3	5	653.390	48.016	-92.252	
4	1	971.470	74.318	11.130	
4	2	971.470	74.318	-17.557	
4	3	971.470	74.318	-46.245	
4	4	971.470	74.318	-74.932	
4	5	971.470	74.318	-103.619	

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN
5	1	660.096	105.872	-25.790
5	2	660.096	105.872	-48.657
5	3	660.096	105.872	-71.523
5	4	660.096	105.872	-94.390
5	5	660.096	105.872	-117.257
6	1	433.031	132.563	-57.020
6	2	433.031	132.563	-74.963
6	3	433.031	132.563	-92.906
6	4	433.031	132.563	-110.849
6	5	433.031	132.563	-128.792

TOTAL AREA 21057.132

SURFACE/AXIS NUMBER = 4   SURFACE/AXIS NAME = VERT TAIL - ROOT   GD BODY NAME = VERTTAIL

INTEGRATION TYPE CODE = 3   SREF = 247.400   BREF = 206.760   CREF = 188.950

BODY TYPE CODE = 3   SYMMETRY CODE = ON

NUMBER OF ROWS = 2   THETA = 90.00 DEG

INTEGRATION AXIS DEFINITION   ORIGIN AT XN = 1535.560
YN = 75.000
SWEEP ANGLE = 0.000 DEG

ROW DATA

NUMBER	YN	NUMBER OF PANELS
1	96.566	5
2	117.404	5

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN
1	1	1217.063	21.566	98.032
1	2	1217.063	21.566	48.322
1	3	1217.063	21.566	-1.387
1	4	1217.063	21.566	-51.097
1	5	1217.063	21.566	-100.806
2	1	780.196	42.404	73.940
2	2	780.196	42.404	28.029
2	3	780.196	42.404	-17.882
2	4	780.196	42.404	-63.794
2	5	780.196	42.404	-109.705

TOTAL AREA 9986.297

SURFACE/AXIS NUMBER = 5   SURFACE/AXIS NAME = FWD FUS SG VERT   GD BODY NAME = FUSELAGE

INTEGRATION TYPE CODE = 1   SREF = 1946.000   BREF = 822.060   CREF = 184.050

BODY TYPE CODE = 1   SYMMETRY CODE = ON

NUMBER OF ROWS = 1

INTEGRATION AXIS DEFINITION   FORWARD LIMIT AT   XR = 0.000
AFT LIMIT AT   XR = 528.500
MOMENTS SUMMED ABOUT   XR = 528.500   POSITIVE - NOSE UP

ROW DATA   Y = 0.000   NUMBER OF PANELS = 20

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN
1	1	2731.606	462.290	0.000
1	2	5677.311	373.600	0.000
1	3	7404.302	285.000	0.000
1	4	9074.412	196.400	0.000
1	5	10341.924	107.800	0.000
1	6	8068.122	31.750	0.000
1	7	0.000	0.000	0.000
1	8	0.000	0.000	0.000
1	9	0.000	0.000	0.000
1	10	0.000	0.000	0.000
1	11	0.000	0.000	0.000
1	12	0.000	0.000	0.000
1	13	0.000	0.000	0.000
1	14	0.000	0.000	0.000
1	15	0.000	0.000	0.000
1	16	0.000	0.000	0.000
1	17	0.000	0.000	0.000
1	18	0.000	0.000	0.000
1	19	0.000	0.000	0.000
1	20	0.000	0.000	0.000

TOTAL AREA   43317.077

SURFACE/AXIS NUMBER = 6   SURFACE/AXIS NAME = FWD FUS SG LAT   GD BODY NAME = FUSELAGE

INTEGRATION TYPE CODE = 2   SREF = 1946.000   BREF = 820.060   CREF = 184.050

BODY TYPE CODE = 1   SYMMETRY CODE = ON

NUMBER OF ROWS = 1

INTEGRATION AXIS DEFINITION   FORWARD LIMIT AT   XR = 0.000
AFT LIMIT AT   XR = 528.500
MOMENTS SUMMED ABOUT   XR = 528.500   POSITIVE - NOSE RIGHT.

ROW DATA   Y = 0.000   NUMBER OF PANELS = 20

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN
1	1	2731.006	462.200	0.000
1	2	5677.311	373.600	0.000
1	3	7404.302	285.000	0.000
1	4	9074.412	196.400	0.000
1	5	10341.924	107.800	0.000
1	6	8088.122	31.750	0.000
1	7	0.000	0.000	0.000
1	8	0.000	0.000	0.000
1	9	0.000	0.000	0.000
1	10	0.000	0.000	0.000
1	11	0.000	0.000	0.000
1	12	0.000	0.000	0.000
1	13	0.000	0.000	0.000
1	14	0.000	0.000	0.000
1	15	0.000	0.000	0.000
1	16	0.000	0.000	0.000
1	17	0.000	0.000	0.000
1	18	0.000	0.000	0.000
1	19	0.000	0.000	0.000
1	20	0.000	0.000	0.000

TOTAL AREA   43317.077

SURFACE/AXIS NUMBER = 7   SURFACE/AXIS NAME = AFT FUS SG VERT   GD BODY NAME = FUSELAGE

INTEGRATION TYPE CODE = 1   SREF = 1946.000   BREF = 320.080   CREF = 184.050

BODY TYPE CODE = 1   SYMMETRY CODE = ON

NUMBER OF ROWS = 1

INTEGRATION AXIS DEFINITION   FORWARD LIMIT AT XR = 1337.500
AFT LIMIT AT XR = 1800.000
MOMENTS SUMMED ABOUT XR = 1337.500   POSITIVE - TAIL UP

ROW DATA   Y = 0.000   NUMBER OF PANELS = 20

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN
1	1	0.000	0.000	0.000
1	2	0.000	0.000	0.000
1	3	0.000	0.000	0.000
1	4	0.000	0.000	0.000
1	5	0.000	0.000	0.000
1	6	0.000	0.000	0.000
1	7	0.000	0.000	0.000
1	8	0.000	0.000	0.000
1	9	0.000	0.000	0.000
1	10	0.000	0.000	0.000
1	11	0.000	0.000	0.000
1	12	0.000	0.000	0.000
1	13	0.000	0.000	0.000
1	14	0.000	0.000	0.000
1	15	1232.397	6.750	0.000
1	16	7982.328	57.800	0.000
1	17	7825.329	146.400	0.000
1	18	7646.130	235.000	0.000
1	19	5779.201	323.600	0.000
1	20	1878.980	412.200	0.000

TOTAL AREA   32344.415

SURFACE/AXIS NUMBER = 8 SURFACE/AXIS NAME = AFT FUS SG LAT GD BODY NAME = FUSELAGE

INTEGRATION TYPE CODE = 2 SREF = 1946.000 BREF = 820.080 CREF = 164.450

BODY TYPE CODE = 1 SYMMETRY CODE = ON

NUMBER OF ROWS = 1

INTEGRATION AXIS DEFINITION FORWARD LIMIT AT XR = 1337.500
AFT LIMIT AT XR = 1800.000
MOMENTS SUMMED ABOUT XR = 1337.500 POSITIVE - TAIL RIGHT

ROW DATA Y = 0.000 NUMBER OF PANELS = 20

PANEL DATA

INDEX		AREA-IN2	BARM-IN	TARM-IN
1	1	0.000	0.000	0.000
1	2	0.000	0.000	0.000
1	3	0.000	0.000	0.000
1	4	0.000	0.000	0.000
1	5	0.000	0.000	0.000
1	6	0.000	0.000	0.000
1	7	0.000	0.000	0.000
1	8	0.000	0.000	0.000
1	9	0.000	0.000	0.000
1	10	0.000	0.000	0.000
1	11	0.000	0.000	0.000
1	12	0.000	0.000	0.000
1	13	0.000	0.000	0.000
1	14	0.000	0.000	0.000
1	15	1232.397	6.750	0.000
1	16	7982.328	57.800	0.000
1	17	7825.329	146.400	0.000
1	18	7646.180	235.000	0.000
1	19	5779.201	323.600	0.000
1	20	1873.980	412.200	0.000

TOTAL AREA 32344.415

ADDITIONAL LOADS OPTION

SURFACE/AXIS NUMBER = 31   SURFACE/AXIS NAME = VT ROOT TOTAL

INTEGRATION TYPE CODE = 4   SREF = 247.460   BREF = 206.760   CREF = 188.950

SYMMETRY CODE = ON   NUMBER OF TERMS = 6

COMPONENT DEFINITION FOR   CENTERLINE LOAD

TERM	INDICES	COMPONENT DESCRIPTION			V FACTOR	B FACTOR	T FACTOR
1	3 3 1	VERT TAIL - SG	CL	V	1.000	61.560	-46.440
2	3 3 2	VERT TAIL - SG	CL	B	0.000	1.000	0.000
3	3 3 3	VERT TAIL - SG	CL	T	0.000	0.000	1.000
4	4 3 1	VERT TAIL - ROOT	CL	V	1.000	0.000	0.000
5	4 3 2	VERT TAIL - ROOT	CL	B	0.000	1.000	0.000
6	4 3 3	VERT TAIL - ROOT	CL	T	0.000	0.000	1.000

ADDITIONAL LOADS OPTION

SURFACE/AXIS NUMBER = 32   SURFACE/AXIS NAME = AFT FUS SG V-TOT

INTEGRATION TYPE CODE = 4   SREF = 1946.000   BREF = 620.080   CREF = 184.050

SYMMETRY CODE = ON   NUMBER OF TERMS = 6

COMPONENT DEFINITION FOR   CENTERLINE LOAD

TERM	INDICES			COMPONENT DESCRIPTION			V FACTOR	B FACTOR	T FACTOR
1	7	3	1	AFT FUS SG VERT	CL	V	1.000	0.000	0.000
2	7	3	2	AFT FUS SG VERT	CL	B	0.000	1.000	0.000
3	2	1	1	HORIZ TAIL - SG	LH	V	1.000	244.500	0.000
4	2	2	1	HORIZ TAIL - SG	RH	V	1.000	244.500	0.000
5	2	1	3	HORIZ TAIL - SG	LH	T	0.000	-1.000	0.000
6	2	2	3	HORIZ TAIL - SG	RH	T	0.000	-1.000	0.000

ADDITIONAL LOADS OPTION

SURFACE/AXIS NUMBER = 33   SURFACE/AXIS NAME = AFT FUS SG L-1CT

INTEGRATION TYPE CODE = 4   SREF = 1946.000   BREF = 820.080   CREF = 184.050

SYMMETRY CODE = ON   NUMBER OF TERMS = 10

COMPONENT DEFINITION FOR   CENTERLINE LOAD

TERM	INDICES			COMPONENT DESCRIPTION			V FACTOR	B FACTOR	T FACTOR
1	8	3	1	AFT FUS SG LAT	CL	V	1.000	0.000	0.000
2	8	3	2	AFT FUS SG LAT	CL	B	0.000	1.000	0.000
3	8	3	3	AFT FUS SG LAT	CL	T	0.000	0.000	1.000
4	31	3	1	VT ROOT TOTAL	CL	V	1.000	198.000	41.000
5	31	3	2	VT ROOT TOTAL	CL	B	0.000	0.000	1.000
6	31	3	3	VT ROOT TOTAL	CL	T	0.000	-1.000	0.000
7	2	1	1	HORIZ TAIL - SG	LH	V	0.000	0.000	10.750
8	2	2	1	HORIZ TAIL - SG	RH	V	0.000	0.000	-10.750
9	2	1	2	HORIZ TAIL - SG	LH	B	0.000	0.000	1.000
10	2	2	2	HORIZ TAIL - SG	RH	B	0.000	0.000	-1.000

```
   MFA     SCOPE 3.4.2          DS17 CMR G 07/23/81
14.08.15.B1FS14I  FROM
14.08.15.IP  00000384 WORDS - FILE INPUT  , DC 00
14.08.15.81FS1,T777,FTN,1462.
14.08.07.ATTACH(LGO,$FSLIP3S,ID=SIMS,MR=1)
14.08.08.PF CYCLE NO. = 001
14.08.08.PAUSE.    PLEASE MOUNT FRC077
14.09.25.GO.
14.10.25.MOUNT(VSN=FRC077,SN=FLRF1)
14.09.29.GO.
14.11.45.MOUNTED VSN=FRC077,SN=FLRF1
14.11.45.ATTACH(GDTAPE,$81 GD-205,ID=SIMS,MR=1,SN
14.11.45.=FLRF1)
14.11.45.PF CYCLE NO. = 002
14.11.47.COPY(GDTAPE,TAPE30)
14.11.48.MAP(OFF)
14.11.48.LGO(PL=10000)
15.57.40.     STOP
15.57.40.      2.817 CP SECONDS EXECUTION TIME
15.57.40.OP  00002816 WORDS - FILE OUTPUT , DC 40
15.57.40.MP  00001344 WORDS - FILE PUNCH  , DC 10
15.57.40.CPA        2.874 SEC.        2.874 ADJ.
15.57.40.CPB        3.606 SEC.        3.606 ADJ.
15.57.40.IO         1.162 SEC.        1.162 ADJ.
15.57.40.CM       270.049 KWS.       16.482 ADJ.
15.57.40.SS                          24.125
15.57.40.PP         9.419 SEC.     DATE 08/10/81
15.57.40.EJ  END OF JOB, **

************           81FS14I  //// END OF LIST ////
************           81FS14I  //// END OF LIST ////
```

8.2 Integration and Wind Tunnel Options

This example creates the revised geometry file with GOP = 2 and the wind tunnel coefficient file with WOP = 2 using card input. For brevity, only 1 pressure case for an asymmetric flight condition ($\alpha=0$, $\beta=+8$) is input on cards with POP = 1. The integration and wind tunnel loads options are then executed for all load stations. In addition, comparisons for 6 selected load stations are output using the summary print option.

Card input listing for example 8.2

```
CARD            1         2         3         4         5         6         7         8
 NO    12345678901234567890123456789012345678901234567890123456789012345678901234567890

  1         GOP 2     POP 1     ROP 0     SOP 0     IOP 1     WOP 2
  2    TTTTTTTT                      TTT
  3    TTTTTTTTTTTTTT                                           INTEGRATE ASYMMETRIC
  4    01   01   WING - SG AXIS                                 WIND TUNNEL  ASYMMETRIC
  5    02   03   H T  - SG AXIS
  6    06   08   F F  - SG AXIS (LAT)
  7    03   05   V T  - SG AXIS
  8    51   06   V T  - ROOF TOTAL
  9    33   14   A F  - TOTAL (LAT)
 10                        SUMMARY PRINT TERMINATOR
 11    08   NSAD                      03   NALD
 12    1   WING - SG AXIS   WING2     3   0    9  1945.000   820.080   184.050
 13    1             166.023        5
 14         1    1     0.000     0.000     0.000
 15         1    2     0.000     0.000     0.000
 16         1    3     0.000     0.000     0.000
 17         1    4
 18         1    5
 19    2             208.430        5
 20         2    1     0.000     0.000     0.000
 21         2    2     0.000     0.000     0.000
 22         2    3   240.559     9.391   -23.688
 23         2    4  2499.882    37.166   -50.712
 24         2    5  3078.947    98.103   -84.051
 25    3             245.245        5
 26         3    1     0.000     0.000     0.000
 27         3    2   348.747    12.541    13.358
 28         3    3  2189.756    39.651   -11.371
 29         3    4  2618.773    97.892   -42.315
 30         3    5  2618.773   164.907   -76.199
 31    4             280.220        5
 32         4    1   792.891    19.598    46.131
 33         4    2  2229.513    50.026    21.195
 34         4    3  2389.586   107.243    -8.399
 35         4    4  2389.586   168.404   -38.866
 36         4    5  2389.586   229.565   -69.333
 37    5             312.775        5
 38         5    1  1865.969    66.901    48.067
 39         5    2  1865.969   122.612    20.315
 40         5    3  1865.969   178.323    -7.438
 41         5    4  1865.969   234.035   -35.190
 42         5    5  1865.969   289.746   -62.942
 43    6             347.552        5
 44         6    1  2226.145   154.478    43.295
 45         6    2  2226.145   204.368    18.442
 46         6    3  2226.145   254.258    -6.411
 47         6    4  2226.145   304.148   -31.263
 48         6    5  2226.145   354.038   -56.116
 49    7             387.246        5
 50         7    1  1904.691   254.436    37.847
 51         7    2  1904.691   297.661    16.304
 52         7    3  1904.691   340.927    -5.238
 53         7    4  1904.691   384.173   -26.781
 54         7    5  1904.691   427.418   -48.324
 55    8             423.704        5
 56         8    1  1216.113   343.147    34.387
 57         8    2  1216.113   374.094    18.970
 58         8    3  1216.113   405.042     3.554
 59         8    4  1216.113   435.990   -11.863
 60         8    5  1216.113   466.938   -27.279
 61    9             456.000        5
 62         9    1   397.976   418.302    33.030
 63         9    2   397.976   431.496    26.458
 64         9    3   397.976   444.689    19.886
 65         9    4   397.976   457.883    13.313
 66         9    5   397.976   471.076     6.741
 67    2   HORIZ TAIL - SG  HORZTAIL  3   0    6  238.770   259.030   149.380
 68    1              21.506        5
 69         1    1  1263.184    16.236    54.720
 70         1    2  1263.184    16.236    16.141
 71         1    3  1263.184    16.236   -22.438
```

CARD NO — 1234567890123456789012345678901234567890123456789012345678901234567890123456789O (card columns 1–80)

CARD NO									
72		1	4	1263.184	16.236	-61.017			
73		1	5	1263.184	16.236	-99.595			
74	2			68.120	5				
75		2	1	1765.972	57.370	23.765			
76		2	2	1765.972	57.370	-11.330			
77		2	3	1765.972	57.370	-46.365			
78		2	4	1765.972	57.370	-81.400			
79		2	5	1765.972	57.370	-116.435			
80	3			116.362	5				
81		3	1	1406.099	106.112	-16.883			
82		3	2	1406.099	106.112	-46.866			
83		3	3	1406.099	106.112	-76.849			
84		3	4	1406.099	106.112	-106.832			
85		3	5	1406.099	106.112	-136.815			
86	4			164.204	5				
87		4	1	1199.702	153.454	-56.304			
88		4	2	1199.702	153.454	-81.381			
89		4	3	1199.702	153.454	-106.457			
90		4	4	1199.702	153.454	-131.533			
91		4	5	1199.702	153.454	-156.610			
92	5			207.859	5				
93		5	1	798.922	197.109	-92.656			
94		5	2	798.922	197.109	-113.208			
95		5	3	798.922	197.109	-133.760			
96		5	4	798.922	197.109	-154.311			
97		5	5	798.922	197.109	-174.863			
98	6			249.416	5				
99		6	1	725.942	238.666	-127.261			
100		6	2	725.942	238.666	-143.506			
101		6	3	725.942	238.666	-159.750			
102		6	4	725.942	238.666	-175.994			
103		6	5	725.942	238.666	-192.239			
104	3	VERT	TAIL	- SG	VERTTIP	3 1 6	247.400	206.760	188.950
105	1			137.790	5				
106		1	1	553.150	6.653	90.303			
107		1	2	553.150	6.653	49.133			
108		1	3	553.150	6.653	7.964			
109		1	4	553.150	6.653	-33.206			
110		1	5	553.150	6.653	-74.375			
111	2			162.245	5				
112		2	1	940.289	25.685	68.034			
113		2	2	940.289	25.685	30.376			
114		2	3	940.289	25.685	-7.283			
115		2	4	940.289	25.685	-44.942			
116		2	5	940.289	25.685	-82.600			
117	3			184.376	5				
118		3	1	653.390	48.016	41.906			
119		3	2	653.390	48.016	8.366			
120		3	3	653.390	48.016	-25.173			
121		3	4	653.390	48.016	-58.712			
122		3	5	653.390	48.016	-92.252			
123	4			210.878	5				
124		4	1	971.470	74.318	11.130			
125		4	2	971.470	74.318	-17.557			
126		4	3	971.470	74.318	-46.245			
127		4	4	971.470	74.318	-74.932			
128		4	5	971.470	74.318	-103.619			
129	5			242.432	5				
130		5	1	660.096	105.872	-25.790			
131		5	2	660.096	105.872	-48.657			
132		5	3	660.096	105.872	-71.523			
133		5	4	660.096	105.872	-94.390			
134		5	5	660.096	105.872	-117.257			
135	6			269.123	5				
136		6	1	433.031	132.563	-57.020			
137		6	2	433.031	132.563	-74.963			
138		6	3	433.031	132.563	-92.906			
139		6	4	433.031	132.563	-110.849			
140		6	5	433.031	132.563	-128.792			
141	4	VERT	TAIL	- ROOT	VERTTAIL	3 1 2	247.400	206.760	188.950
142	1			96.566	5				

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CARD               1         2         3         4         5         6         7         8
 NO      12345678901234567890123456789012345678901234567890123456789012345678901234567890

 143          1     1  1217.063    21.566    98.032
 144          1     2  1217.063    21.566    48.322
 145          1     3  1217.063    21.566    -1.387
 146          1     4  1217.063    21.566   -51.097
 147          1     5  1217.063    21.566  -100.806
 148     2              117.404         5
 149          2     1   780.196    42.404    73.940
 150          2     2   780.196    42.404    28.029
 151          2     3   780.196    42.404   -17.862
 152          2     4   780.196    42.404   -63.794
 153          2     5   780.196    42.404  -109.705
 154     5    FWD  FUS  SG VERT   FUSELAGE   1  1   1   1946.000    820.080    184.050
 155     1                0.000        20
 156          1     1  2731.006   462.200     0.000
 157          1     2  5677.311   373.600     0.000
 158          1     3  7404.302   285.000     0.000
 159          1     4  9074.412   196.400     0.000
 160          1     5 10341.924   107.800     0.000
 161          1     6  8088.122    31.750     0.000
 162          1     7     0.000     0.000     0.000
 163          1     8     0.000     0.000     0.000
 164          1     9     0.000     0.000     0.000
 165          1    10     0.000     0.000     0.000
 166          1    11     0.000     0.000     0.000
 167          1    12     0.000     0.000     0.000
 168          1    13     0.000     0.000     0.000
 169          1    14     0.000     0.000     0.000
 170          1    15     0.000     0.000     0.000
 171          1    16     0.000     0.000     0.000
 172          1    17     0.000     0.000     0.000
 173          1    18     0.000     0.000     0.000
 174          1    19     0.000     0.000     0.000
 175          1    20     0.000     0.000     0.000
 176     6    FWD  FUS  SG LAT    FUSELAGE   2  1   1   1946.000    820.080    184.050
 177     1                0.000        20
 178          1     1  2731.006   462.200     0.000
 179          1     2  5677.311   373.600     0.000
 180          1     3  7404.302   285.000     0.000
 181          1     4  9074.412   196.400     0.000
 182          1     5 10341.924   107.800     0.000
 183          1     6  8088.122    31.750     0.000
 184          1     7     0.000     0.000     0.000
 185          1     8     0.000     0.000     0.000
 186          1     9     0.000     0.000     0.000
 187          1    10     0.000     0.000     0.000
 188          1    11     0.000     0.000     0.000
 189          1    12     0.000     0.000     0.000
 190          1    13     0.000     0.000     0.000
 191          1    14     0.000     0.000     0.000
 192          1    15     0.000     0.000     0.000
 193          1    16     0.000     0.000     0.000
 194          1    17     0.000     0.000     0.000
 195          1    18     0.000     0.000     0.000
 196          1    19     0.000     0.000     0.000
 197          1    20     0.000     0.000     0.000
 198     7    AFT  FUS  SG VERT   FUSELAGE   1  1   1   1946.000    820.080    184.050
 199     1                0.000        20
 200          1     1     0.000     0.000     0.000
 201          1     2     0.000     0.000     0.000
 202          1     3     0.000     0.000     0.000
 203          1     4     0.000     0.000     0.000
 204          1     5     0.000     0.000     0.000
 205          1     6     0.000     0.000     0.000
 206          1     7     0.000     0.000     0.000
 207          1     8     0.000     0.000     0.000
 208          1     9     0.000     0.000     0.000
 209          1    10     0.000     0.000     0.000
 210          1    11     0.000     0.000     0.000
 211          1    12     0.000     0.000     0.000
 212          1    13     0.000     0.000     0.000
 213          1    14     0.000     0.000     0.000
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CARD           1         2         3         4         5         6         7         8
 NO   12345678901234567890123456789012345678901234567890123456789012345678901234567890

214        1    15   1232.397       6.750        0.000
215        1    15   7982.328      57.800        0.000
216        1    17   7825.329     146.400        0.000
217        1    18   7646.180     235.000        0.000
218        1    19   5779.201     323.600        0.000
219        1    20   1878.980     412.200        0.000
220    8   AFT  FUS  SG LAT      FUSELAGE   2   1     1     1946.000     820.080     184.050
221    -                0.000          20
222        1     1      0.000       0.000        0.000
223        1     2      0.000       0.000        0.000
224        1     3      0.000       0.000        0.000
225        1     4      0.000       0.000        0.000
226        1     5      0.000       0.000        0.000
227        1     6      0.000       0.000        0.000
228        1     7      0.000       0.000        0.000
229        1     8      0.000       0.000        0.000
230        1     9      0.000       0.000        0.000
231        1    10      0.000       0.000        0.000
232        1    11      0.000       0.000        0.000
233        1    12      0.000       0.000        0.000
234        1    13      0.000       0.000        0.000
235        1    14      0.000       0.000        0.000
236        1    15   1232.397       6.750        0.000
237        1    16   7982.328      57.800        0.000
238        1    17   7825.329     146.400        0.000
239        1    18   7646.160     235.000        0.000
240        1    19   5779.201     323.600        0.000
241        1    20   1878.980     412.200        0.000
242   31   VT ROOT   TOTAL                  4   1     6      247.40      206.76      188.95
243   03    3    1       1.00       61.56       -46.44
244   03    3    2       0.00        1.00         0.00
245   03    3    3       0.00        3.00         1.00
246   04    3    1       1.00        0.00         0.00
247   04    3    2       0.00        1.00         0.00
248   04    3    3       0.00        0.00         1.00
249   32   AFT  FUS  SG V-TOT               4   1     6     1946.00      820.08      184.05
250   07    3    1       1.00        0.00         0.00
251   07    3    2       0.00        1.00         0.00
252   02    1    1       1.00      244.50         0.00
253   02    2    1       1.00      244.50         0.00
254   02    1    3       0.00       -1.00         0.00
255   02    2    3       0.00       -1.00         0.00
256   33   AFT  FUS  SG L-TOT               4   1    10     1946.00      820.08      184.05
257   08    3    1       1.00        0.00         0.00
258   08    3    2       0.00        1.00         0.00
259   08    3    3       0.00        0.00         1.00
260   31    3    1       1.00      198.06        41.00
261   31    3    2       0.00        0.00         1.00
262   31    3    3       0.00       -1.00         0.00
263   02    1    1       0.00        0.00        10.75
264   02    2    1       0.00        0.00       -10.75
265   02    1    2       0.00        0.00         1.00
266   02    2    2       0.00        0.00        -1.00
267   81 ARS     WOP-20    RIGID WIND TUNNEL DATA      M=1.20      WS=67.5     9-29-80
268    1   WING - SG AXIS        1946.00       820.08     184.05
269              101 .029213    .008831   -.003133     ALPHA = 0                   M%1.20   SW  %  67.5
270              102 .012051    .003229    .000584     ALPHA                       M%1.20   SW  %  67.5
271              103 .0         .0         .0          ALPHA DOT                   M%1.20   SW  %  67.5
272              104-.000290   -.000057    .000034     DELTA SPOILER               M%1.20   SW  %  67.5
273              105-.003232   -.000955   -.000223     ROLL VELOC P                M%1.20   SW  %  67.5
274              106 .042987    .012062   -.001284     PITCH VELOC Q               M%1.20   SW  %  67.5
275              107-.000759   -.000167    .000149     BETA ALPHA ZERO A/S         M%1.20   SW  %  67.5
276              108-.000226   -.000058   -.000025     BETA ALPHA A/S              M%1.20   SW  %  67.5
277              109 .000311    .000119   -.000174     BETA ALPHA ZERO SYM         M%1.20   SW  %  67.5
278              110 .000008    .000005   -.000011     BETA ALPHA SYM              M%1.20   SW  %  67.5
279              111                                   FILLER                      M %1.20  SW  %  67.5
280              112                                   FILLER                      M %1.20  SW  %  67.5
281              113                                   FILLER                      M %1.20  SW  %  67.5
282              114                                   FILLER                      M %1.20  SW  %  67.5
283              115                                   FILLER                      M %1.20  SW  %  67.5
284     2  HORIZ TAIL - SG      238.77      259.03     149.38
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CARD           1         2         3         4         5         6         7         8
 NO   12345678901234567890123456789012345678901234567890123456789012345678901234567890

285            201-.136152  -.049452    .051116   ALPHA = 0              M%1.20  SW % 67.5
286            202 .042237   .016920   -.019427   ALPHA                  M%1.20  SW % 67.5
287            203 .060513   .027107   -.027833   DELTA H                M%1.20  SW % 67.5
288            204 .233930   .104789   -.107540   ALPHA DOT              M%1.20  SW % 67.5
289            205-.017738  -.006993    .004648   BETA                   M%1.20  SW % 67.5
290            206 .049585   .022735   -.022025   DELTA H PRIME          M%1.20  SW % 67.5
291            207-.000753  -.000317    .000269   DELTA SPOILER SYM      M%1.20  SW % 67.5
292            208 .000277   .000145   -.000168   DELTA SPOILER A/S      M%1.20  SW % 67.5
293            209-.002479  -.002088    .002313   ROLL VELOCITY P        M%1.20  SW % 67.5
294            210 .552160   .254971   -.297065   PITCH VELOCITY Q       M%1.20  SW % 67.5
295            211                                FILLER                 M %1.20 SW % 67.5
296            212                                FILLER                 M %1.20 SW % 67.5
297            213                                FILLER                 M %1.20 SW % 67.5
298            214                                FILLER                 M %1.20 SW % 67.5
299            215                                FILLER                 M %1.20 SW % 67.5
300     3   VERT TAIL - SG       247.40    206.76   188.95
301            301-.034484  -.010927    .003146   BETA ALPHA=0    136.56 M%1.20  SW % 67.5
302            302-.001115  -.000354    .000102   BETA ALPHA      136.56 M%1.20  SW % 67.5
303            303-.003032  -.000630    .000464   DELTA H PRIME   136.56 M%1.20  SW % 67.5
304            304-.000270  -.000089    .000023   DELTA SPOILER   136.56 M%1.20  SW % 67.5
305            305 .009663   .002854   -.003630   DELTA RUD UP    136.56 M%1.20  SW % 67.5
306            306 .0        .0         .0        DELTA RUD LOW   136.56 M%1.20  SW % 67.5
307            307-.003995  -.001461    .000756   ROLL VELOC P    136.56 M%1.20  SW % 67.5
308            308 .032297   .010244   -.005595   YAW VELOC R     136.56 M%1.20  SW % 67.5
309            309                                FILLER                 M %1.20 SW % 67.5
310            310                                FILLER                 M %1.20 SW % 67.5
311            311                                FILLER                 M %1.20 SW % 67.5
312            312                                FILLER                 M %1.20 SW % 67.5
313            313                                FILLER                 M %1.20 SW % 67.5
314            314                                FILLER                 M %1.20 SW % 67.5
315            315                                FILLER                 M %1.20 SW % 67.5
316     4   VERT TAIL ROOT       247.40    206.76   188.95
317            401-.053487  -.023324    .010230   BETA ALPHA=0    WL  75 M%1.20  SW % 67.5
318            402-.001730  -.000755    .000331   BETA ALPHA      WL  75 M%1.20  SW % 67.5
319            403-.002353  -.001621    .001072   DELTA H PRIME   WL  75 M%1.20  SW % 67.5
320            404-.000349  -.000177    .000079   DELTA SPOILER   WL  75 M%1.20  SW % 67.5
321            405 .009675   .005734   -.006210   DELTA RUD UP    WL  75 M%1.20  SW % 67.5
322            406 .003878   .000352   -.001119   DELTA RUD LOW   WL  75 M%1.20  SW % 67.5
323            407-.003790  -.002645    .002065   ROLL VELOC P    WL  75 M%1.20  SW % 67.5
324            408 .047596   .022154   -.013930   YAW VELOC R     WL  75 M%1.20  SW % 67.5
325            409                                FILLER                 M %1.20 SW % 67.5
326            410                                FILLER                 M %1.20 SW % 67.5
327            411                                FILLER                 M %1.20 SW % 67.5
328            412                                FILLER                 M %1.20 SW % 67.5
329            413                                FILLER                 M %1.20 SW % 67.5
330            414                                FILLER                 M %1.20 SW % 67.5
331            415                                FILLER                 M %1.20 SW % 67.5
332     5   FWD FUS SG          1946.00    820.08   184.05
333            501 .00317   -.000822    .0        ALPHA=0 (VERTICAL)     M %1.20 SW % 67.5
334            502 .00188    .000605    .0        ALPHA (VERTICAL)       M %1.20 SW % 67.5
335            503 .00014    .00004     .00002    ROLL VEL.P (LATERAL)   M %1.20 SW % 67.5
336            504-.00571   -.00166    -.00099    BETA (LATERAL)         M %1.20 SW % 67.5
337            505                                FILLER                 M %1.20 SW % 67.5
338            506                                FILLER                 M %1.20 SW % 67.5
339            507                                FILLER                 M %1.20 SW % 67.5
340            508                                FILLER                 M %1.20 SW % 67.5
341            509                                FILLER                 M %1.20 SW % 67.5
342            510                                FILLER                 M %1.20 SW % 67.5
343            511                                FILLER                 M %1.20 SW % 67.5
344            512                                FILLER                 M %1.20 SW % 67.5
345            513                                FILLER                 M %1.20 SW % 67.5
346            514                                FILLER                 M %1.20 SW % 67.5
347            515                                FILLER                 M %1.20 SW % 67.5
348     6   AFT FUS SG          1945.00    820.08   184.05   244.50  10.75 198.06  41.00
349            601 .00530    .002173    .0        ALPHA=0 (VERTICAL)     M %1.20 SW % 67.5
350            602-.00046   -.000118    .0        ALPHA (VERTICAL)       M %1.20 SW % 67.5
351            603-.00211   -.00030    -.00037    BETA ALPHA=0 C/O(LAT)M %1.20 SW % 67.5
352            604-.00007   -.00001    -.00001    BETA ALPHA C/O (LAT) M %1.20 SW % 67.5
353            605 .00022    .00006     .00004    DELTA H PRIME (LAT)  M %1.20 SW % 67.5
354            606 .00009    .00001     .00002    DELTA RUDDER LOWER(L)M %1.20 SW % 67.5
355            607 .00044    .00011     .00008    ROLL VELOCITY P (LAT)M %1.20 SW % 67.5
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CARD           1         2         3         4         5         6         7         8
 NO   12345678901234567890123456789012345678901234567890123456789012345678901234567890

356          608-.00168    -.00034    -.00029       BETA (LATERAL)        M %1.20 SW % 67.5
357          609                                    FILLER                M %1.20 SW % 67.5
358          610                                    FILLER                M %1.20 SW % 67.5
359          611                                    FILLER                M %1.20 SW % 67.5
360          612                                    FILLER                M %1.20 SW % 67.5
361          613                                    FILLER                M %1.20 SW % 67.5
362          614                                    FILLER                M %1.20 SW % 67.5
363          615                                    FILLER                M %1.20 SW % 67.5

364   7/8/9        END OF RECORD        1

365   1    03    982.32     QBAR
366   1    04    1245.1     VTAS
367   1    02    8.0        BETA

368   7/8/9        END OF RECORD        2

369   1.0          CASE
370   BI ARS      SDSS-3C.2.1D    67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8
371   NASA/DFRC     BOB SIMS      EXT 308
372      8.0000      2.0000       1.2000      0.0000     8.0000   982.3151
373   VERTTAIL       2.0000      90.0000
374     96.5665      5.0000
375       .0991      0.0000        .6462      -.6462 1437.5285
376       .2993      0.0000        .4574      -.4574 1487.2380
377       .4994      0.0000        .5850      -.5850 1536.9475
378       .6995      0.0000        .4035      -.4035 1585.6570
379       .8997      0.0000        .1038      -.1038 1636.3664
380    117.4044      5.0000
381       .0995      0.0000        .8009      -.8009 1461.6198
382       .2996      0.0000        .6260      -.6260 1507.5311
383       .4997      0.0000        .5953      -.5953 1553.4425
384       .6997      0.0000        .3307      -.3307 1599.3538
385       .8998      0.0000        .0458      -.0458 1645.2652
386   VERTTIP        6.0000      90.0000
387    137.7898      5.0000
388       .0988      0.0000        .9417      -.9417 1485.3523
389       .2990      0.0000        .1576      -.1576 1527.5221
390       .4992      0.0000        .3073      -.3073 1569.6918
391       .6994      0.0000        .3683      -.3683 1611.8616
392       .8996      0.0000        .3330      -.3330 1654.0314
393    162.2446      5.0000
394       .0984      0.0000       1.0583     -1.0583 1513.9658
395       .2987      0.0000        .2534      -.2534 1551.6245
396       .4989      0.0000        .3536      -.3536 1589.2831
397       .6992      0.0000        .3684      -.3684 1626.9418
398       .8994      0.0000        .3399      -.3399 1664.6005
399    184.5756      5.0000
400       .0988      0.0000       1.1589     -1.1589 1540.0944
401       .2990      0.0000        .3699      -.3699 1573.6337
402       .4992      0.0000        .3960      -.3960 1607.1731
403       .6994      0.0000        .3662      -.3662 1640.7124
404       .8995      0.0000        .3429      -.3429 1674.2517
405    210.8781      5.0000
406       .0949      0.0000       1.3447     -1.3447 1570.8699
407       .2957      0.0000        .4612      -.4612 1599.5573
408       .4965      0.0000        .4443      -.4443 1628.2447
409       .6973      0.0000        .4069      -.4069 1656.9321
410       .8981      0.0000        .3081      -.3081 1685.6195
411    242.4320      5.0000
412       .0942      0.0000       1.5950     -1.5950 1607.7899
413       .2951      0.0000        .5742      -.5742 1630.6566
414       .4960      0.0000        .5005      -.5005 1653.5234
415       .6969      0.0000        .2977      -.2977 1676.3901
416       .8978      0.0000        .1184      -.1184 1699.2568
417    269.1231      5.0000
418       .0934      0.0000       1.8874     -1.8874 1639.0201
419       .2944      0.0000        .5312      -.5312 1656.9632
420       .4955      0.0000        .1397      -.1397 1674.9063
421       .6965      0.0000        .0690      -.0690 1692.8494
422       .8975      0.0000        .0474      -.0474 1710.7925
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CARD             1         2         3         4         5         6         7         8
 NO     12345678901234567890123456789012345678901234567890123456789012345678901234567890

 423    WING1               2.0000    -1.9400
 424       71.0699          5.0000
 425         .0967           .0602       .0052      .1152  675.4899
 426         .2975         -.0068      -.0054     -.0083  821.0326
 427         .4984           .0010      -.0480      .0540  966.5762
 428         .6992           .0454       .0589      .0320 1112.1198
 429         .9000           .0839       .0873      .0805 1257.6634
 430      122.1584          5.0000
 431         .0970           .0265      -.0227      .0758  789.7062
 432         .2978           .0458      -.0232      .1148  906.7428
 433         .4985         -.0081      -.0200      .0637 1023.7794
 434         .6993           .1029       .0704      .1354 1140.8161
 435         .9000           .1793       .1835      .1752 1257.8527
 436    WING2               9.0000    -1.9400
 437      165.9276          5.0000
 438         .0953         -.0231      -.0655      .0193  887.5599
 439         .2964           .0223       .2420     -.1974  980.1737
 440         .4976           .2447       .0784      .4110 1072.7874
 441         .6968           .0723       .1682     -.0237 1165.4011
 442         .9000           .0536       .1158     -.0086 1258.0149
 443      208.3103          5.0000
 444         .0997         -.0332       .0181     -.0846  971.3564
 445         .2997           .1249       .1226      .1273 1050.3069
 446         .4997           .1562       .1055      .2269 1129.2573
 447         .6997           .0556       .1431     -.0319 1208.2077
 448         .8997           .1229       .1559      .0898 1287.1582
 449      245.1043          5.0000
 450         .0984           .0199       .0355      .0044 1043.9731
 451         .2985           .1212       .0992      .1433 1118.8429
 452         .4987           .0984       .1295      .0673 1193.7127
 453         .6988           .1032       .1420      .0644 1268.5825
 454         .8989           .1326       .1398      .1253 1343.4523
 455      260.0598          5.0000
 456         .0981           .0684       .0616      .0753 1124.9494
 457         .2983           .0916       .1102      .0730 1193.2784
 458         .4984           .1017       .1185      .0849 1261.6074
 459         .6986           .1368       .1519      .1217 1329.9365
 460         .8987           .1253       .1303      .1202 1398.2655
 461      312.5952          5.0000
 462         .0983           .0949       .0885      .1012 1200.3195
 463         .2985           .0882       .1110      .0655 1262.5606
 464         .4986           .1211       .1317      .1106 1324.8017
 465         .6987           .1466       .1501      .1436 1387.0428
 466         .8989           .1149       .1189      .1110 1449.2840
 467      347.3528          5.0000
 468         .0963           .1097       .1165      .1028 1280.8371
 469         .2966           .1123       .1185      .1061 1336.5746
 470         .4969           .1394       .1422      .1365 1392.3120
 471         .6972           .1366       .1406      .1325 1448.0494
 472         .8975           .1069       .1071      .1067 1503.7868
 473      387.0238          5.0000
 474         .0952           .1456       .1495      .1418 1372.7372
 475         .2955           .1333       .1346      .1318 1421.0515
 476         .4959           .1367       .1407      .1328 1469.3658
 477         .6963           .1193       .1190      .1196 1517.6801
 478         .8967           .0868       .0840      .0896 1565.9945
 479      423.4607          5.0000
 480         .1000           .2007       .2002      .2012 1453.6845
 481         .3000           .1333       .1400      .1267 1488.2595
 482         .5000           .1289       .1248      .1329 1522.8346
 483         .7000           .0474       .0450      .0498 1557.4096
 484         .9000           .1478       .1439      .1516 1591.9846
 485      455.7386          5.0000
 486         .1000           .2928       .2911      .2946 1521.5604
 487         .3000           .1150       .1117      .1184 1536.3002
 488         .5000         -.0354      -.0385     -.0323 1551.0401
 489         .7000           .3116       .3102      .3130 1565.7799
 490         .9000           .1237       .1214      .1260 1580.5197
 491    HORZTAIL            6.0000     1.0000
 492       21.5032          5.0000
 493         .0992         -.0604       .2846     -.4054 1523.7916
```

CARD NO	1	2	3	4	5
494	.2993	-.0559	.0873	-.1991	1562.6997
495	.4994	-.0437	-.0546	-.0335	1601.6077
496	.6994	-.0021	-.1391	.1349	1640.5158
497	.8995	-.0102	-.1616	.1413	1679.4238
498	68.1097	5.0000			
499	.0970	-.0728	.3143	-.4598	1558.2948
500	.2974	-.0517	.0508	-.1543	1593.3298
501	.4977	-.0314	-.0636	.0007	1628.3648
502	.6981	-.0026	-.1593	.1542	1653.3999
503	.8965	-.0221	-.2452	.2010	1698.4349
504	116.8445	5.0000			
505	.0964	-.0980	.2745	-.4706	1598.8828
506	.2969	-.0503	.0315	-.1322	1629.8659
507	.4973	-.0320	-.0722	.0081	1658.8490
508	.6978	-.0096	-.1605	.1413	1688.8320
509	.8982	-.0276	-.2262	.1710	1718.8151
510	164.1783	5.0000			
511	.0947	-.1351	.2117	-.4819	1638.3045
512	.2954	-.0517	.0215	-.1248	1663.3808
513	.4960	-.0390	-.0703	-.0077	1688.4571
514	.6967	-.0180	-.1495	.1135	1713.5334
515	.8973	-.0281	-.1897	.1335	1738.6098
516	207.8270	5.0000			
517	.0948	-.1700	.1720	-.5120	1674.6563
518	.2954	-.0594	.0070	-.1259	1695.2079
519	.4961	-.0505	-.0749	-.0260	1715.7596
520	.6967	-.0357	-.1414	.0701	1736.3112
521	.8974	-.0171	-.1641	.1300	1756.8629
522	249.3778	5.0000			
523	.0568	-.2265	.1159	-.5688	1709.2612
524	.2902	-.0721	-.0019	-.1424	1725.5057
525	.4916	-.0278	-.0646	.0091	1741.7501
526	.6930	-.0004	-.1235	.1226	1757.9945
527	.8944	.0032	-.1525	.1569	1774.2389
528	PLATE	1.0000	-87.5000		
529	146.4763	4.0000			
530	.0969	.0599	-.4056	.5253	951.8000
531	.3384	-.1720	.0250	-.3590	1058.3000
532	.6195	.1093	-.1194	.3381	1183.3000
533	.8600	.0691	.1135	.0246	1299.1500
534	CANARD	1.0000	-30.0000		
535	48.2700	2.0000			
536	.1250	-.4614	-1.3920	.4691	230.5311
537	.6250	-.1793	-.4972	.1387	244.8045
538	FUSELAGE	1.0	0.0		
539	0.0	20.0			
540	.0250	-.0976	-.2731		
541	.0750	-.1580	-.1389		
542	.1250	-.2340	-.1155		
543	.1750	.2906	-.0939		
544	.2250	.1490	-.0636		
545	.2750	.1192	-.0497		
546	.3250	-.0363	-.0037		
547	.3750	-.1099	.0907		
548	.4250	-.0744	.0911		
549	.4750	-.0008	.0765		
550	.5250	.0202	.1050		
551	.5750	.0319	.0135		
552	.6250	.0339	-.0113		
553	.6750	.1001	.0519		
554	.7250	.0935	.0415		
555	.7750	.0120	-.0173		
556	.8250	.0289	-.1550		
557	.8750	.0807	-.2512		
558	.9250	-.0507	.0576		
559	.9750	-.2572	.5606		

Program output listing for example 8.2

INTEGRATION OPTION

CASE 1 B1 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
MR=ASYM TAS =1245.1

SAN= 1 WING - SG AXIS CPBODY=WING2 ITC=3 SC=OFF THETA= -1.94 SREF= 1946.000 BREF= 820.08 CREF= 184.05

PANEL		AREA IN2	BARM IN	TARM IN	CP-L	V-L KIPS	B-L IN-KIPS	T-L IN-KIPS	CP-R	V-R KIPS	B-R IN-KIPS	T-R IN-KIPS
1	1	0.00	0.00	0.00	.0193	0.000	0.000	0.000	-.0655	0.000	0.000	0.000
1	2	0.00	0.00	0.00	-.1974	0.000	0.000	0.000	.2420	0.000	0.000	0.000
1	3	0.00	0.00	0.00	.4110	0.000	0.000	0.000	.0784	0.000	0.000	0.000
1	4	0.00	0.00	0.00	-.0237	0.000	0.000	0.000	.1662	0.000	0.000	0.000
1	5	0.00	0.00	0.00	-.0086	0.000	0.000	0.000	.1158	0.000	0.000	0.000
2	1	0.00	0.00	0.00	-.0846	0.000	0.000	0.000	.0181	0.000	0.000	0.000
2	2	0.00	0.00	0.00	.1273	0.000	0.000	0.000	.1226	0.000	0.000	0.000
2	3	240.56	9.39	-23.69	.2269	.372	3.497	-8.820	.1055	.173	1.626	-4.101
2	4	2499.88	37.17	-50.71	-.0319	-.544	-20.218	27.587	.1431	2.440	90.697	-123.754
2	5	3076.95	98.10	-84.05	.0898	1.886	185.033	-158.529	.1559	3.274	321.232	-275.220
3	1	0.00	0.00	0.00	.0044	0.000	0.000	0.000	.0355	0.000	0.000	0.000
3	2	348.75	12.54	15.36	.1433	.341	4.275	4.554	.0992	.236	2.960	3.152
3	3	2189.76	39.65	-11.37	.0673	1.005	39.861	-11.431	.1295	1.934	76.702	-21.996
3	4	2618.77	97.89	-42.82	.0644	1.150	112.621	-49.257	.1420	2.537	248.326	-108.610
3	5	2618.77	164.91	-76.20	.1253	2.238	369.127	-170.564	.1398	2.497	411.844	-190.302
4	1	792.89	19.60	46.13	.0753	.407	7.982	18.788	.0616	.333	6.530	15.370
4	2	2229.51	50.03	21.20	.0730	1.110	55.541	23.532	.1102	1.676	83.845	35.523
4	3	2389.69	107.24	-8.40	.0849	1.384	148.425	-11.624	.1185	1.932	207.165	-16.225
4	4	2389.69	168.40	-38.87	.1217	1.984	334.097	-77.106	.1519	2.476	417.003	-96.240
4	5	2389.69	229.57	-69.33	.1202	1.959	449.821	-135.854	.1303	2.124	487.617	-147.270
5	1	1865.97	66.90	48.07	.1012	1.288	86.180	61.918	.0885	1.127	75.365	54.148
5	2	1865.97	122.61	20.32	.0655	.834	102.227	16.938	.1110	1.413	173.240	28.703
5	3	1865.97	178.32	-7.44	.1106	1.408	251.047	-10.471	.1317	1.676	298.941	-12.469
5	4	1865.97	234.04	-35.19	.1436	1.828	427.787	-64.323	.1501	1.911	447.151	-67.235
5	5	1865.97	289.75	-62.94	.1110	1.413	409.386	-88.932	.1189	1.513	438.523	-95.261
6	1	2226.15	154.48	43.30	.1028	1.561	241.158	67.588	.1165	1.769	273.297	76.596
6	2	2226.15	204.37	18.44	.1061	1.611	329.284	29.714	.1185	1.800	367.767	33.187
6	3	2226.15	254.25	-6.41	.1365	2.073	527.047	-13.289	.1422	2.159	549.055	-13.844
6	4	2226.15	304.15	-31.26	.1325	2.012	611.988	-62.905	.1406	2.135	649.400	-66.751
6	5	2226.15	354.04	-56.12	.1067	1.620	573.662	-90.927	.1071	1.626	575.813	-91.268
7	1	1904.69	254.44	37.85	.1418	1.842	468.778	69.730	.1495	1.942	494.234	73.517
7	2	1904.69	297.68	16.30	.1318	1.712	509.776	27.920	.1348	1.751	521.379	28.556
7	3	1904.69	340.93	-5.24	.1328	1.725	588.264	-9.038	.1407	1.828	623.259	-9.576
7	4	1904.69	384.17	-26.78	.1196	1.554	596.995	-41.617	.1190	1.546	594.000	-41.406
7	5	1904.69	427.42	-48.32	.0896	1.164	497.592	-56.258	.0840	1.091	466.493	-52.742
8	1	1216.11	343.15	34.39	.2012	1.669	572.757	57.396	.2002	1.661	569.910	57.111
8	2	1216.11	374.09	16.97	.1267	1.051	393.206	19.939	.1400	1.161	434.481	22.032
8	3	1216.11	405.04	3.55	.1329	1.103	446.568	3.918	.1248	1.035	419.353	3.680
8	4	1216.11	435.99	-11.86	.0498	.413	180.123	-4.901	.0450	.373	162.761	-4.429
8	5	1216.11	465.94	-27.28	.1516	1.258	587.247	-34.306	.1439	1.194	557.420	-32.565

INTEGRATION OPTION

SAN= 1 WING - SG AXIS

PANEL	AREA IN2	BARM IN	TARM IN	CP-L	V-L KIPS	B-L IN-KIPS	T-L IN-KIPS	CP-R	V-R KIPS	B-R IN-KIPS	T-R IN-KIPS
9 1	397.98	418.30	33.03	.2946	.860	334.555	26.417	.2911	.790	330.551	26.103
9 2	397.98	431.50	26.46	.1184	.321	138.699	8.505	.1117	.303	130.853	8.023
9 3	397.98	444.69	19.89	-.0323	-.088	-38.995	-1.744	-.0385	-.105	-46.480	-2.079
9 4	397.98	457.88	13.31	.3130	.850	389.085	11.313	.3102	.842	385.604	11.211
9 5	397.98	471.03	6.74	.1260	.342	161.141	2.306	.1214	.330	155.258	2.222
TOTAL INTEGRATED LOADS					44.660	11075.619	-623.834		54.508	12003.200	-994.208
TOTAL LOADS PER QBAR					.045464	11.275017	-.635066		.055490	12.219297	-1.012107
TOTAL LOAD COEFFICIENTS					.023363	.007065	-.001773		.028515	.007657	-.002826

INTEGRATION OPTION

CASE 1 B1 AKS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
MR=ASYM TAS =1245.1

SAN= 2 HORIZ TAIL - SG CPBODY=HORZTAIL ITC=3 SC=OFF THETA= 1.00 SREF= 238.770 BREF= 259.03 CREF= 149.38

PANEL		AREA IN2	BARM IN	TARM IN	CP-L	V-L KIPS	B-L IN-KIPS	T-L IN-KIPS	CP-R	V-R KIPS	B-R IN-KIPS	T-R IN-KIPS
1	1	1263.18	16.24	54.72	-.4054	-3.493	-56.718	-191.155	.2846	2.452	39.817	134.195
1	2	1263.18	16.24	16.14	-.1991	-1.716	-27.855	-27.692	.0873	.752	12.214	12.142
1	3	1263.18	16.24	-22.44	-.0335	-.289	-4.687	6.477	-.0540	-.465	-7.555	10.441
1	4	1263.18	16.24	-61.02	.1349	1.162	18.873	-70.928	-.1391	-1.199	-19.461	73.136
1	5	1263.18	16.24	-99.59	.1413	1.218	19.769	-121.265	-.1616	-1.393	-22.609	138.686
2	1	1765.97	57.37	23.71	-.4598	-5.539	-317.780	-131.305	.3143	3.786	217.221	89.755
2	2	1765.97	57.37	-11.33	-.1543	-1.859	-106.641	21.060	.0508	.612	35.109	-6.934
2	3	1765.97	57.37	-46.37	.0007	.008	.484	-.391	-.0636	-.766	-43.955	35.524
2	4	1765.97	57.37	-81.40	.1542	1.858	106.572	-151.210	-.1593	-1.919	-110.095	156.211
2	5	1765.97	57.37	-116.44	.2010	2.421	138.916	-281.937	-.2452	-2.954	-169.464	343.935
3	1	1406.10	106.11	-16.88	-.4706	-4.514	-478.984	76.209	.2745	2.633	279.390	-44.453
3	2	1406.10	106.11	-46.87	-.1322	-1.268	-134.555	59.426	.0315	.302	32.061	-14.160
3	3	1406.10	106.11	-76.85	.0081	.078	8.244	-5.971	-.0722	-.693	-73.466	53.221
3	4	1406.10	106.11	-106.83	.1413	1.355	143.817	-144.793	-.1605	-1.539	-163.359	164.468
3	5	1406.10	106.11	-136.82	.1710	1.640	174.046	-224.406	-.2262	-2.170	-230.230	296.846
4	1	1199.70	153.45	-56.30	-.4819	-3.944	-605.197	222.054	.2117	1.733	255.865	-97.549
4	2	1199.70	153.45	-81.38	-.1248	-1.021	-156.731	83.119	.0215	.176	27.001	-14.319
4	3	1199.70	153.45	-106.46	-.0077	-.063	-9.670	6.709	-.0703	-.575	-88.287	61.248
4	4	1199.70	153.45	-131.53	.1135	.929	142.540	-122.178	-.1495	-1.223	-187.751	160.930
4	5	1199.70	153.45	-156.61	.1335	1.093	167.657	-171.105	-.1897	-1.552	-238.236	243.136
5	1	798.92	197.11	-92.66	-.5120	-2.790	-550.008	258.545	.1720	.937	184.768	-86.855
5	2	798.92	197.11	-113.21	-.1259	-.686	-135.246	77.678	.0070	.038	7.520	-4.319
5	3	798.92	197.11	-133.76	-.0260	-.142	-27.930	18.954	-.0749	-.408	-80.460	54.601
5	4	798.92	197.11	-154.31	.0701	.382	75.304	-58.953	-.1414	-.771	-151.897	116.916
5	5	798.92	197.11	-174.86	.1300	.708	139.651	-123.889	-.1641	-.894	-176.262	156.386
6	1	725.94	238.67	-127.26	-.5688	-2.817	-672.265	358.464	.1159	.574	136.982	-73.641
6	2	725.94	238.67	-143.51	-.1424	-.705	-168.303	101.198	-.0019	-.009	-2.245	1.350
6	3	725.94	238.67	-159.75	.0091	.045	10.755	-7.199	-.0646	-.320	-76.351	51.105
6	4	725.94	238.67	-175.99	.1226	.607	144.901	-106.851	-.1235	-.612	-145.965	107.635
6	5	725.94	238.67	-192.24	.1589	.787	187.804	-151.271	-.1525	-.755	-180.240	145.178

	V-L	B-L	T-L	V-R	B-R	T-R
TOTAL INTEGRATED LOADS	-16.554	-1973.236	-802.605	-6.222	-929.980	2267.415
TOTAL LOADS PER QBAR	-.016852	-2.008761	-.817054	-.006334	-.946723	2.308236
TOTAL LOAD COEFFICIENTS	-.070579	-.032479	-.022908	-.026527	-.015307	.064715

INTEGRATION OPTION

CASE 1 81 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
MR=ASYM TAS =1245.1

SAN= 3 VERT TAIL - SG CPBODY=VERTTIP ITC=3 SC= ON THETA= 90.00 SREF= 247.400 BREF= 206.76 CREF= 186.95

PANEL		AREA IN2	BARM IN	TARM IN	CP-R	V-R KIPS	B-R IN-KIPS	T-R IN-KIPS
1	1	553.15	6.65	90.30	-.9417	-3.553	-23.641	-320.882
1	2	553.15	6.65	49.13	-.1576	-.595	-3.956	-29.219
1	3	553.15	6.65	7.96	-.3073	-1.160	-7.715	-9.235
1	4	553.15	6.65	-33.21	-.3683	-1.390	-9.245	46.148
1	5	553.15	6.65	-74.38	-.3330	-1.257	-8.360	93.455
2	1	940.29	25.69	68.03	-1.0583	-6.788	-174.356	-461.832
2	2	940.29	25.69	30.38	-.2534	-1.625	-41.748	-49.373
2	3	940.29	25.69	-7.28	-.3536	-2.268	-58.256	16.519
2	4	940.29	25.69	-44.94	-.3684	-2.363	-60.694	106.199
2	5	940.29	25.69	-82.60	-.3399	-2.180	-55.999	180.086
3	1	653.39	48.02	41.91	-1.1589	-5.165	-248.023	-216.463
3	2	653.39	48.02	8.37	-.3699	-1.649	-79.165	-13.793
3	3	653.39	48.02	-25.17	-.3960	-1.765	-84.750	44.431
3	4	653.39	48.02	-58.71	-.3862	-1.721	-82.653	101.065
3	5	653.39	48.02	-92.25	-.3429	-1.528	-73.386	140.995
4	1	971.47	74.32	11.13	-1.3447	-8.911	-662.273	-99.183
4	2	971.47	74.32	-17.56	-.4612	-3.056	-227.144	53.661
4	3	971.47	74.32	-46.25	-.4443	-2.944	-218.821	136.163
4	4	971.47	74.32	-74.93	-.4069	-2.697	-200.401	202.056
4	5	971.47	74.32	-103.62	-.3081	-2.042	-151.741	211.567
5	1	660.10	105.87	-25.79	-1.5959	-7.182	-760.391	185.228
5	2	660.10	105.87	-48.66	-.5742	-2.586	-273.741	125.807
5	3	660.10	105.87	-71.52	-.5005	-2.254	-238.606	161.193
5	4	660.10	105.87	-94.39	-.2977	-1.341	-141.924	126.532
5	5	660.10	105.87	-117.26	-.1184	-.533	-56.445	62.515
6	1	433.03	132.55	-57.02	-1.8874	-5.575	-739.084	317.906
6	2	433.03	132.55	-74.96	-.5312	-1.569	-208.012	117.628
6	3	433.03	132.55	-92.91	-.1397	-.413	-54.705	38.340
6	4	433.03	132.55	-110.85	-.0690	-.204	-27.020	22.594
6	5	433.03	132.55	-126.79	-.0474	-.140	-18.561	18.033

TOTAL INTEGRATED LOADS	-76.454	-4990.817	1308.142
TOTAL LOADS PER QBAR	-.077831	-5.080668	1.331692
TOTAL LOAD COEFFICIENTS	-.314595	-.099324	.028488

INTEGRATION OPTION

CASE 1 B1 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 992.3
MR=ASYM TAS =1245.1

SAN= 4 VERT TAIL - ROOT CPBODY=VERTTAIL ITC=3 SC= ON THETA= 90.00 SREF= 247.400 BREF= 205.76 CREF= 188.95

PANEL	AREA IN2	BARM IN	TARM IN	CP-R	V-R KIPS	B-R IN-KIPS	T-R IN-KIPS
1 1	1217.06	21.57	98.03	-.6462	-5.365	-115.701	-525.940
1 2	1217.06	21.57	48.32	-.4574	-3.797	-91.897	-183.593
1 3	1217.05	21.57	-1.39	-.5950	-4.857	-104.743	6.736
1 4	1217.06	21.57	-51.10	-.4035	-3.350	-72.246	171.175
1 5	1217.06	21.57	-100.81	-.1038	-.862	-18.585	86.873
2 1	780.20	42.40	73.94	-.8009	-4.263	-180.750	-315.174
2 2	780.20	42.40	28.03	-.6260	-3.332	-141.278	-93.384
2 3	780.20	42.40	-17.98	-.5953	-3.168	-134.349	56.656
2 4	780.20	42.40	-63.79	-.3307	-1.760	-74.633	112.281
2 5	780.20	42.40	-109.71	-.0458	-.244	-10.336	26.741

	V-R	B-R	T-R
TOTAL INTEGRATED LOADS	-30.998	-934.519	-657.538
TOTAL LOADS PER QBAR	-.031556	-.951343	-.669376
TOTAL LOAD COEFFICIENTS	-.127549	-.018598	-.014319

INTEGRATION OPTION

CASE 1 61 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 562.3
MR=ASYM TAS =1245.1

SAN= 5 FWD FUS SG VERT CPBODY=FUSELAGE ITC=1 SC= ON SREF= 1946.000 BREF= 820.08 CREF= 164.05

PANEL	AREA IN2	BARM IN	TARM IN	CP-R	V-R KIPS	B-R IN-KIPS	T-R IN-KIPS
1 1	2731.01	462.20	0.00	-.0978	-1.822	-842.131	0.000
1 2	5677.31	373.60	0.00	-.1880	-7.281	-2720.168	0.000
1 3	7404.30	285.00	0.00	-.2340	-11.819	-3368.474	0.000
1 4	9074.41	195.40	0.00	.2906	17.989	3533.002	0.000
1 5	10341.92	107.30	0.00	.1490	10.512	1133.169	0.000
1 6	8086.12	31.75	0.00	.1182	6.522	207.060	0.000
1 7	0.00	0.00	0.00	-.0363	0.000	0.000	0.000
1 8	0.00	0.00	0.00	-.1099	0.000	0.000	0.000
1 9	0.00	0.00	0.00	-.0744	0.000	0.000	0.000
1 10	0.00	0.00	0.00	-.0038	0.000	0.000	0.000
1 11	0.00	0.00	0.00	.0202	0.000	0.000	0.000
1 12	0.00	0.00	0.00	.0319	0.000	0.000	0.000
1 13	0.00	0.00	0.00	.0339	0.000	0.000	0.000
1 14	0.00	0.00	0.00	.1001	0.000	0.000	0.000
1 15	0.00	0.00	0.00	.0935	0.000	0.000	0.000
1 16	0.00	0.00	0.00	.0120	0.000	0.000	0.000
1 17	0.00	0.00	0.00	.0289	0.000	0.000	0.000
1 18	0.00	0.00	0.00	.0807	0.000	0.000	0.000
1 19	0.00	0.00	0.00	-.0507	0.000	0.000	0.000
1 20	0.00	0.00	0.00	-.2572	0.000	0.000	0.000

	V-R	B-R	T-R
TOTAL INTEGRATED LOADS	14.100	-2057.541	0.000
TOTAL LOADS PER QBAR	.014354	-2.094584	0.000000
TOTAL LOAD COEFFICIENTS	.007376	-.001312	0.000000

INTEGRATION OPTION

CASE 1 B1 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
MR=ASYM TAS =1245.1

SAN= 6 FWD FUS SG LAT CPBODY=FUSELAGE ITC=2 SC= ON SREF= 1946.000 BREF= 820.08 CREF= 164.05

PANEL	AREA IN2	BARM IN	TARM IN	CP-R	V-R KIPS	B-R IN-KIPS	T-R IN-KIPS
1 1	2731.01	462.20	0.00	-.2731	-5.088	-2351.596	0.000
1 2	5677.31	373.60	0.00	-.1369	-5.379	-2009.741	0.000
1 3	7404.30	285.00	0.00	-.1155	-5.834	-1662.644	0.000
1 4	9074.41	196.40	0.00	-.0939	-5.813	-1141.600	0.000
1 5	10341.92	107.80	0.00	-.0636	-4.487	-483.698	0.000
1 6	8368.12	31.75	0.00	-.0497	-2.742	-87.054	0.000
1 7	0.00	0.00	0.00	-.0037	0.000	0.000	0.000
1 8	0.00	0.00	0.00	.0907	0.000	0.000	0.000
1 9	0.00	0.00	0.00	.0911	0.000	0.000	0.000
1 10	0.00	0.00	0.00	.0765	0.000	0.000	0.000
1 11	0.00	0.00	0.00	.1050	0.000	0.000	0.000
1 12	0.00	0.00	0.00	.0135	0.000	0.000	0.000
1 13	0.00	0.00	0.00	-.0113	0.000	0.000	0.000
1 14	0.00	0.00	0.00	.0519	0.000	0.000	0.000
1 15	0.00	0.00	0.00	.0415	0.000	0.000	0.000
1 16	0.00	0.00	0.00	-.0173	0.000	0.000	0.000
1 17	0.00	0.00	0.00	-.1550	0.000	0.000	0.000
1 18	0.00	0.00	0.00	-.2512	0.000	0.000	0.000
1 19	0.00	0.00	0.00	.0576	0.000	0.000	0.000
1 20	0.00	0.00	0.00	.5806	0.000	0.000	0.000

	V-R	B-R	T-R
TOTAL INTEGRATED LOADS	-29.343	-7736.332	0.000
TOTAL LOADS PER QBAR	-.029871	-7.875612	0.000000
TOTAL LOAD COEFFICIENTS	-.015350	-.004935	0.000000

INTEGRATION OPTION

CASE 1 81 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
MK=ASYM TAS =1245.1

SAN= 7 AFT FUS SG VERT CPBODY=FUSELAGE ITC=1 SC= ON SREF= 1946.000 BREF= 820.98 CREF= 164.05

PANEL	AREA IN2	BARM IN	TARM IN	CP-R	V-R KIPS	B-R IN-KIPS	T-R IN-KIPS
1 1	0.00	0.00	0.00	-.0978	0.000	0.000	0.000
1 2	0.00	0.00	0.00	-.1880	0.000	0.000	0.000
1 3	0.00	0.00	0.00	-.2340	0.000	0.000	0.000
1 4	0.00	0.00	0.00	.2906	0.000	0.000	0.000
1 5	0.00	0.00	0.00	.1490	0.000	0.000	0.000
1 6	0.00	0.00	0.00	.1182	0.000	0.000	0.000
1 7	0.00	0.00	0.00	-.0363	0.000	0.000	0.000
1 8	0.00	0.00	0.00	-.1099	0.000	0.000	0.000
1 9	0.00	0.00	0.00	-.0744	0.000	0.000	0.000
1 10	0.00	0.00	0.00	-.0008	0.000	0.000	0.000
1 11	0.00	0.00	0.00	.0202	0.000	0.000	0.000
1 12	0.00	0.00	0.00	.0319	0.000	0.000	0.000
1 13	0.00	0.00	0.00	.0339	0.000	0.000	0.000
1 14	0.00	0.00	0.00	.1001	0.000	0.000	0.000
1 15	1232.40	6.75	0.00	.0935	.786	5.306	0.000
1 16	7982.33	57.80	0.00	.0120	.653	37.768	0.000
1 17	7825.33	146.40	0.00	.0289	1.543	225.855	0.000
1 18	7646.18	235.00	0.00	.0807	4.209	969.178	0.000
1 19	5779.20	323.60	0.00	-.0507	-1.999	-646.894	-0.000
1 20	1678.98	412.20	0.00	-.2572	-3.297	-1358.906	0.000

	V-R	B-R	T-R
TOTAL INTEGRATED LOADS	1.896	-747.603	0.000
TOTAL LOADS PER QBAR	.001930	-.761063	0.000000
TOTAL LOAD COEFFICIENTS	.000992	-.000477	0.000000

INTEGRATION OPTION

CASE 1   81 ARS   SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8   ALPHA= 0.00   BETA= 8.00   QBAR= 982.3
MR=ASYM   TAS =1245.1

SAN= 8 AFT FUS SG LAT   CPBODY=FUSELAGE   ITC=2   SC= ON   SREF= 1946.000   BREF= 820.08   CREF= 184.05

PANEL	AREA IN2	BARM IN	TARM IN	CP-R	V-R KIPS	B-R IN-KIPS	T-R IN-KIPS
1 1	0.00	0.00	0.00	-.2731	0.000	0.000	0.000
1 2	0.00	0.00	0.00	-.1389	0.000	0.000	0.000
1 3	0.00	0.00	0.00	-.1155	0.000	0.000	0.000
1 4	0.00	0.00	0.00	-.0939	0.000	0.000	0.000
1 5	0.00	0.00	0.00	-.0536	0.000	0.000	0.000
1 6	0.00	0.00	0.00	-.0497	0.000	0.000	0.000
1 7	0.00	0.00	0.00	-.0037	0.000	0.000	0.000
1 8	0.00	0.00	0.00	.0907	0.000	0.000	0.000
1 9	0.00	0.00	0.00	.0911	0.000	0.000	0.000
1 10	0.00	0.00	0.00	.0765	0.000	0.000	0.000
1 11	0.00	0.00	0.00	.1050	0.000	0.000	0.000
1 12	0.00	0.00	0.00	.0135	0.000	0.000	0.000
1 13	0.00	0.00	0.00	-.0113	0.000	0.000	0.000
1 14	0.00	0.00	0.00	.0519	0.000	0.000	0.000
1 15	1232.40	6.75	0.00	.0415	.349	2.355	0.000
1 16	7982.33	57.30	0.00	-.0173	-.942	-54.449	0.000
1 17	7825.33	146.40	0.00	-.1550	-8.274	-1211.333	0.000
1 18	7646.18	235.00	0.00	-.2512	-13.102	-3079.076	0.000
1 19	5779.20	323.60	0.00	.0576	2.271	734.830	0.000
1 20	1878.98	412.20	0.00	.5806	7.442	3067.577	0.000

	V-R	B-R	T-R
TOTAL INTEGRATED LOADS	-12.257	-540.096	0.000
TOTAL LOADS PER QBAR	-.012478	-.549819	0.000000
TOTAL LOAD COEFFICIENTS	-.006412	-.000345	0.000000

ADDITIONAL LOADS OPTION

CASE 1 B1 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
MR=ASYM TAS =1245.1

SAN= 31 VT ROOT TOTAL ITC=4 SC= ON NT= 6 SREF= 247.400 BREF= 206.76 CREF= 186.95

CENTERLINE

	COMPONENT DESCRIPTION	VALUE	V FACTOR	B FACTOR	T FACTOR	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	3 VERT TAIL - SG CL V	-76.454	1.000	61.560	-46.440	-76.454	-4706.534	3550.543	-.314595	-.093666	.077321
2	3 VERT TAIL - SG CL B	-4990.817	0.000	1.000	0.000	0.000	-4990.817	0.000	0.000000	-.099324	0.000000
3	3 VERT TAIL - SG CL T	1308.142	0.000	0.000	1.000	0.000	0.000	1308.142	0.000000	0.000000	.026468
4	4 VERT TAIL - ROOT CL V	-30.998	1.000	0.000	0.000	-30.998	0.000	0.000	-.127549	0.000000	0.000000
5	4 VERT TAIL - ROOT CL B	-934.519	0.000	1.000	0.000	0.000	-934.519	0.000	0.000000	-.018599	0.000000
6	4 VERT TAIL - ROOT CL T	-657.538	0.000	0.000	1.000	0.000	0.000	-657.538	0.000000	0.000000	-.014319
	TOTAL LOADS AND COEFFICIENTS					-107.452	-10631.869	4201.147	-.442144	-.211569	.091489

ADDITIONAL LOADS OPTION

CASE 1 B1 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8
MR=ASYM ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
TAS =1245.1

SAN= 32 AFT FUS SG V-TOT ITC=4 SC= ON NT= 6 SREF= 1946.000 BREF= 820.08 CREF= 184.05

CENTERLINE

	COMPONENT DESCRIPTION	VALUE	V FACTOR	B FACTOR	T FACTOR	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	7 AFT FUS SG VERT CL V	1.896	1.000	0.000	0.000	1.896	0.000	0.000	.000992	0.000000	0.000000
2	7 AFT FUS SG VERT CL B	-747.603	0.000	1.000	0.000	0.000	-747.603	0.000	0.000000	-.000477	0.000000
3	2 HORIZ TAIL - SG LH V	-16.554	1.000	244.500	0.000	-16.554	-4047.497	0.000	-.008660	-.002582	0.000000
4	2 HORIZ TAIL - SG RH V	-6.222	1.000	244.500	0.000	-6.222	-1521.231	0.000	-.003255	-.000970	0.000000
5	2 HORIZ TAIL - SG LH T	-802.605	0.000	-1.000	0.000	0.000	802.605	0.000	0.000000	.000512	0.000000
6	2 HORIZ TAIL - SG RH T	2267.415	0.000	-1.000	0.000	0.000	-2267.415	0.000	0.000000	-.001446	0.000000
	TOTAL LOADS AND COEFFICIENTS					-20.880	-7781.141	0.000	-.010923	-.004964	0.000000

ADDITIONAL LOADS OPTION

CASE 1 B1 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 QBAR= 982.3
MR=ASYM TAS =1245.1

SAN= 33 AFT FUS SG L-TOT ITC=4 SC= ON NT= 10 SREF= 1946.000 BREF= 820.08 CREF= 184.05

CENTERLINE

	COMPONENT DESCRIPTION		VALUE	V FACTOR	B FACTOR	T FACTOR	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	8 AFT FUS SG LAT	CL V	-12.257	1.000	0.000	0.000	-12.257	0.000	0.000	-.006412	0.000000	0.000000
2	8 AFT FUS SG LAT	CL B	-540.096	0.000	1.000	0.000	0.000	-540.096	0.000	0.000000	-.002345	0.000000
3	8 AFT FUS SG LAT	CL T	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000000	0.000000	0.000000
4	31 VT ROOT TOTAL	CL V	-107.452	1.000	198.060	41.000	-107.452	-21281.932	-4405.530	-.056211	-.013576	-.012522
5	31 VT ROOT TOTAL	CL B	-10631.869	0.000	0.000	1.000	0.000	0.000	-10631.869	0.000000	0.000000	-.030219
6	31 VT ROOT TOTAL	CL T	4201.147	0.000	-1.000	0.000	0.000	-4201.147	0.000	0.000000	-.002680	0.000000
7	2 HORIZ TAIL - SG	LH V	-16.554	0.000	0.000	10.750	0.000	0.000	-177.957	0.000000	0.000000	-.000506
8	2 HORIZ TAIL - SG	RH V	-5.222	0.000	0.000	-10.750	0.000	0.000	66.884	0.000000	0.000000	.000190
9	2 HORIZ TAIL - SG	LH B	-1973.236	0.000	0.000	1.000	0.000	0.000	-1973.236	0.000000	0.000000	-.005609
10	2 HORIZ TAIL - SG	RH B	-929.960	0.000	0.000	-1.000	0.000	0.000	929.960	0.000000	0.000000	.002643
	TOTAL LOADS AND COEFFICIENTS						-119.709	-26023.175	-16191.728	-.062623	-.016600	-.046022

INTEGRATION OPTION AND ADDITIONAL LOADS OPTION

CASE 1 COMPLETE

WIND TUNNEL OPTION

CASE 1 81 ARS WDP-20 RIGID WIND TUNNEL DATA M=1.20 WS=67.5 9-29-80 ALPHA= 0.0000 BETA= 8.0000 QBAR= 982.32
P= 0.0 Q= 0.0 R= 0.0 DSL= 0.0 DSR= 0.0 DRU= 0.00 DRL= 0.00 DE= 0.0000 DA= 0.0000 TAS=1245.10

WTN= 1 WING - SG AXIS SREF= 1946.000 BREF= 820.08 CREF= 184.05

LEFT HAND

NSEQ	AERODYNAMIC EFFECT	VALUE	CV PER	CB PER	CT PER	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
101	ALPHA = 0	1.00	.029213	.008831	-.003133	.029213	.008831	-.003133	55.843	13844.011	-1102.280
102	ALPHA	0.00	.012051	.003229	.000584	0.000000	0.000000	0.000000	0.000	0.000	0.000
103	ALPHA DOT	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000	0.000	0.000
104	DELTA SPOILER	0.00	.000290	.000057	-.000034	0.000000	0.000000	0.000000	0.000	0.000	0.000
105	ROLL VELOC P	0.00	-.003232	-.000955	-.000223	0.000000	0.000000	0.000000	0.000	0.000	0.000
106	PITCH VELOC Q	0.00	.042987	.012062	-.001284	0.000000	0.000000	0.000000	0.000	0.000	0.000
107	BETA ALPHA ZERO A/S	8.00	-.000759	-.000167	.000149	-.006072	-.001336	.001192	-11.607	-2094.395	419.380
108	BETA ALPHA A/S	0.00	-.000226	-.000058	-.000025	0.000000	0.000000	0.000000	0.000	0.000	0.000
109	BETA ALPHA ZERO SYM	8.00	.000311	.000119	-.000174	.002488	.000952	-.001392	4.756	1492.413	-489.745
110	BETA ALPHA SYM	0.00	.000008	.000005	-.000011	0.000000	0.000000	0.000000	0.000	0.000	0.000
WLN= 1	TOTAL LOADS ON SURFACE					.025629	.008447	-.003333	48.992	13242.029	-1172.646
WLN= 2	TOTAL LOADS ON SURFACE WITHOUT ALPHA=0 TERM					-.003584	-.000384	-.000200	-6.851	-601.992	-70.366

RIGHT HAND

NSEQ	AERODYNAMIC EFFECT	VALUE	CV PER	CB PER	CT PER	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
101	ALPHA = 0	1.00	.029213	.008831	-.003133	.029213	.008831	-.003133	55.843	13844.011	-1102.280
102	ALPHA	0.00	.012051	.003229	.000584	0.000000	0.000000	0.000000	0.000	0.000	0.000
103	ALPHA DOT	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000	0.000	0.000
104	DELTA SPOILER	0.00	-.000290	-.000057	.000034	0.000000	0.000000	0.000000	0.000	0.000	0.000
105	ROLL VELOC P	0.00	.003232	.000955	.000223	0.000000	0.000000	0.000000	0.000	0.000	0.000
106	PITCH VELOC-Q	0.00	.042987	.012062	-.001284	0.000000	0.000000	0.000000	0.000	0.000	0.000
107	BETA ALPHA ZERO A/S	8.00	.000759	.000167	-.000149	.006072	.001336	-.001192	11.607	2094.395	-419.380
108	BETA ALPHA A/S	0.00	.000226	.000058	.000025	0.000000	0.000000	0.000000	0.000	0.000	0.000
109	BETA ALPHA ZERO SYM	8.00	.000311	.000119	-.000174	.002488	.000952	-.001392	4.756	1492.413	-489.746
110	BETA ALPHA SYM	0.00	.000008	.000005	-.000011	0.000000	0.000000	0.000000	0.000	0.000	0.000
WLN= 1	TOTAL LOADS ON SURFACE					.037773	.011119	-.005717	72.207	17430.618	-2011.406
WLN= 2	TOTAL LOADS ON SURFACE WITHOUT ALPHA=0 TERM					.008560	.002288	-.002584	16.363	3586.607	-909.126

WIND TUNNEL OPTION

CASE 1 B1 ARS WOP-20 RIGID WIND TUNNEL DATA M=1.20 WS=67.5 9-29-80 ALPHA= 0.0000 BETA= 8.0000 QBAR= 982.32
P= 0.0 Q= 0.0 R= 0.0 DSL= 0.0 DSR= 0.0 DRU= 0.00 DRL= 0.00 DE= 0.0000 DA= 0.0000 TAS=1245.10

WTN= 2 HORIZ TAIL - SG SREF= 238.770 BREF= 259.03 CREF= 149.38

LEFT HAND

NSEQ	AERODYNAMIC EFFECT	VALUE	CV PER	CB PER	CT PER	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
201	ALPHA = 0	1.00	-.136182	-.049482	.051116	-.136182	-.049482	.051116	-31.941	-3006.284	1790.944
202	ALPHA	0.00	.042237	.018920	-.019427	0.000000	0.000000	0.000000	0.000	0.000	0.000
203	DELTA H	0.00	.060513	.027107	-.027833	0.000000	0.000000	0.000000	0.000	0.000	0.000
204	ALPHA DOT	0.00	.233930	.104789	-.107545	0.000000	0.000000	0.000000	0.000	0.000	0.000
205	BETA	8.00	-.017738	-.006993	.004648	-.141904	-.055944	.037184	-33.283	-3398.884	1302.811
206	DELTA H PRIME	0.00	.049585	.022735	-.022025	0.000000	0.000000	0.000000	0.000	0.000	0.000
207	DELTA SPOILER SYM	0.00	.000750	.000317	-.000369	0.000000	0.000000	0.000000	0.000	0.000	0.000
208	DELTA SPOILER A/S	0.00	.000277	.000145	-.000168	0.000000	0.000000	0.000000	0.000	0.000	0.000
209	ROLL VELOCITY P	0.00	-.002479	-.002088	.002313	0.000000	0.000000	0.000000	0.000	0.000	0.000
210	PITCH VELOCITY Q	0.00	.552160	.254971	-.297065	0.000000	0.000000	0.000000	0.000	0.000	0.000
WLN= 3	TOTAL LOADS ON SURFACE					-.278086	-.105426	.088300	-65.225	-6405.168	3093.755
WLN= 4	TOTAL LOADS ON SURFACE WITHOUT ALPHA=0 TERM					-.141904	-.055944	.037184	-33.283	-3398.884	1302.811

RIGHT HAND

NSEQ	AERODYNAMIC EFFECT	VALUE	CV PER	CB PER	CT PER	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
201	ALPHA = 0	1.00	-.136182	-.049482	.051116	-.136182	-.049482	.051116	-31.941	-3006.284	1790.944
202	ALPHA	0.00	.042237	.018920	-.019427	0.000000	0.000000	0.000000	0.000	0.000	0.000
203	DELTA H	0.00	.060513	.027107	-.027833	0.000000	0.000000	0.000000	0.000	0.000	0.000
204	ALPHA DOT	0.00	.233930	.104789	-.107545	0.000000	0.000000	0.000000	0.000	0.000	0.000
205	BETA	8.00	.017738	.006993	-.004648	.141904	.055944	-.037184	33.283	3398.884	-1302.811
206	DELTA H PRIME	0.00	-.049585	-.022735	.022025	0.000000	0.000000	0.000000	0.000	0.000	0.000
207	DELTA SPOILER SYM	0.00	-.000750	-.000317	.000369	0.000000	0.000000	0.000000	0.000	0.000	0.000
208	DELTA SPOILER A/S	0.00	-.000277	-.000145	.000168	0.000000	0.000000	0.000000	0.000	0.000	0.000
209	ROLL VELOCITY P	0.00	.002479	.002088	-.002313	0.000000	0.000000	0.000000	0.000	0.000	0.000
210	PITCH VELOCITY Q	0.00	.552160	.254971	-.297065	0.000000	0.000000	0.000000	0.000	0.000	0.000
WLN= 3	TOTAL LOADS ON SURFACE					.005722	.006462	.013932	1.342	392.600	488.134
WLN= 4	TOTAL LOADS ON SURFACE WITHOUT ALPHA=0 TERM					.141904	.055944	-.037184	33.283	3398.884	-1302.811

WIND TUNNEL OPTION

CASE 1   B1 AFS   WDP-20   RIGID WIND TUNNEL DATA   M=1.20   WS=67.5   9-29-80   ALPHA= 0.0000   BETA= 8.0000   QBAR= 982.32
P= 0.0   Q= 0.0   R= 0.0   DSL= 0.0   DSR= 0.0   DRU= 0.00   DRL= 0.00   DE= 0.0000   DA= 0.0000   TAS=1245.10

*TN= 3 VERT TAIL - SG   SREF= 247.400   BREF= 206.76   CREF= 188.95

NSEQ	AERODYNAMIC EFFECT		VALUE	CV PER	CB PER	CT PER	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
301	BETA ALPHA=0	136.56	8.00	-.034464	-.010927	.003146	-.275872	-.087416	.025168	-67.044	-4392.483	1155.708
302	BETA ALPHA	136.56	0.00	-.001115	-.000354	.000102	0.000000	0.000000	0.000000	0.000	0.000	0.000
303	DELTA H PRIME	136.56	0.00	-.003032	-.000800	.000464	0.000000	0.000000	0.000000	0.000	0.000	0.000
304	DELTA SPOILER	136.56	0.00	-.000270	-.000089	.000023	0.000000	0.000000	0.000000	0.000	0.000	0.000
305	DELTA RUD UP	136.56	0.00	.009663	.002854	-.003830	0.000000	0.000000	0.000000	0.000	0.000	0.000
306	DELTA RUD LOW	136.56	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000	0.000	0.000
307	ROLL VELOC P	136.56	0.00	-.003995	-.001461	.000756	0.000000	0.000000	0.000000	0.000	0.000	0.000
308	YAW VELOC R	136.56	0.00	.032297	.010244	-.005596	0.000000	0.000000	0.000000	0.000	0.000	0.000
*LN= 5	TOTAL LOADS ON SURFACE						-.275872	-.087416	.025168	-67.044	-4392.483	1155.708

*TN= 4 VERT TAIL ROOT   SREF= 247.400   BREF= 206.76   CREF= 188.95

NSEQ	AERODYNAMIC EFFECT		VALUE	CV PER	CB PER	CT PER	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
401	BETA ALPHA=0	WL 75	8.00	-.053487	-.023324	.010230	-.427896	-.186592	.081840	-103.990	-9375.884	3758.073
402	BETA ALPHA	WL 75	0.00	-.001730	-.000755	.000331	0.000000	0.000000	0.000000	0.000	0.000	0.000
403	DELTA H PRIME	WL 75	0.00	-.002353	-.001621	.001072	0.000000	0.000000	0.000000	0.000	0.000	0.000
404	DELTA SPOILER	WL 75	0.00	-.000349	-.000177	.000079	0.000000	0.000000	0.000000	0.000	0.000	0.000
405	DELTA RUD UP	WL 75	0.00	.009675	.005734	-.006210	0.000000	0.000000	0.000000	0.000	0.000	0.000
406	DELTA RUD LOW	WL 75	0.00	.003876	.000352	-.001119	0.000000	0.000000	0.000000	0.000	0.000	0.000
407	ROLL VELOC P	WL 75	0.00	-.003700	-.002645	.002065	0.000000	0.000000	0.000000	0.000	0.000	0.000
408	YAW VELOC R	WL 75	0.00	.047596	.022154	-.013930	0.000000	0.000000	0.000000	0.000	0.000	0.000
*LN= 6	TOTAL LOADS ON SURFACE						-.427896	-.186592	.081840	-103.990	-9375.884	3758.073

WIND TUNNEL OPTION

CASE 1   B1 ARS   WOP-20   RIGID WIND TUNNEL DATA   M=1.20   WS=67.5   9-29-80   ALPHA= 0.0000   BETA= 0.0000   QBAR= 982.32
P= 0.0   Q= 0.0   R= 0.0   DSL= 0.0   DSR= 0.0   DRU= 0.00   DRL= 0.00   DE= 0.0000   DA= 0.0000   TAS=1245.10

WTN= 5 FWD FUS SG   SREF= 1946.000   BREF= 820.06   CREF= 184.05

VERTICAL

NSEQ	AERODYNAMIC EFFECT	VALUE	CV PER	CB PER	CT PER	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
501	ALPHA=0 (VERTICAL)	1.00	.003170	-.000822	0.000000	.003170	-.000822	0.000000	6.060	-1288.617	0.000
502	ALPHA (VERTICAL)	0.00	.001880	.000605	0.000000	0.000000	0.000000	0.000000	0.000	0.000	0.000
WLN= 7	TOTAL LOADS ON SURFACE					.003170	-.000822	0.000000	6.060	-1288.617	0.000

LATERAL

NSEQ	AERODYNAMIC EFFECT	VALUE	CV PER	CB PER	CT PER	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
503	ROLL VEL.P (LATERAL)	0.00	.000140	.000040	.000020	0.000000	0.000000	0.000000	0.000	0.000	0.000
504	BETA (LATERAL)	8.00	-.005710	-.001660	-.000990	-.045680	-.013280	-.007920	-87.322	-20818.533	-2786.486
WLN= 8	TOTAL LOADS ON SURFACE					-.045680	-.013280	-.007920	-87.322	-20818.533	-2786.486

WIND TUNNEL OPTION

CASE 1 81 ARS WDP-20 RIGID WIND TUNNEL DATA M=1.20 WS=67.5 9-29-80 ALPHA= 0.0000 BETA= 8.0000 QBAR= 952.32
P= 0.0 Q= 0.0 R= 0.0 DSL= 0.0 DSR= 0.0 DRU= 0.00 DRL= 0.00 DE= 0.0000 DA= 0.0000 TAS=1245.10

WTN= 6 AFT FUS SG SREF= 1946.000 BREF= 820.08 CREF= 164.05 XHT=244.50 YHT= 10.75 XVT=198.06 ZVT= 41.00

VERTICAL

NSEQ	AERODYNAMIC EFFECT	VALUE	CV PER	CB PER	CT PER	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
601	ALPHA=0 (VERTICAL)	1.00	.005300	.002173	0.000000	.005300	.002173	0.000000	10.131	3406.526	0.000
602	ALPHA (VERTICAL)	0.00	-.000460	-.000118	0.000000	0.000000	0.000000	0.000000	0.000	0.000	0.000
WLN= 9	TOTAL LOADS ON SURFACE					.005300	.002173	0.000000	10.131	3406.526	0.000

TAIL INDUCED LOADS

			V FACTOR	B FACTOR	T FACTOR	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
LHT V	-65.225	KIPS	1.00	244.50	-	-.034121	-.010173	-	-65.225	-15947.431	-
RHT V	1.342	KIPS	1.00	244.50	-	.000702	.000209	-	1.342	328.140	-
LHT T	3093.755	IN-KIPS	-	-1.00	-	-	-.001973	-	-	-3093.755	-
RHT T	488.134	IN-KIPS	-	-1.00	-	-	-.000311	-	-	-488.134	-
WLN= 10	TOTAL TAIL LOADS ADDING TO AFT FUSELAGE					-.033418	-.012248	-	-63.883	-19201.179	-
WLN= 11	TOTAL LOADS ON AFT FUSELAGE - VERTICAL					-.028118	-.010075	-	-53.751	-15794.653	-

LATERAL

NSEQ	AERODYNAMIC EFFECT	VALUE	CV PER	CB PER	CT PER	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
603	BETA ALPHA=0 C/D(LAT)	8.00	-.002110	-.000300	-.000370	-.016880	-.002400	-.002960	-32.268	-3762.395	-1041.414
604	BETA ALPHA C/D (LAT)	0.00	-.000070	-.000010	-.000010	0.000000	0.000000	0.000000	0.000	0.000	0.000
605	DELTA H PRIME (LAT)	0.00	.000220	.000060	.000040	0.000000	0.000000	0.000000	0.000	0.000	0.000
606	DELTA RUDDER LOWER(L)	0.00	.000090	.000010	.000020	0.000000	0.000000	0.000000	0.000	0.000	0.000
607	ROLL VELOCITY P (LAT)	0.00	.000440	.000110	.000080	0.000000	0.000000	0.000000	0.000	0.000	0.000
608	BETA (LATERAL)	8.00	-.001660	-.000340	-.000290	-.013440	-.002720	-.002320	-25.692	-4264.037	-816.243
WLN= 12	TOTAL LOADS ON SURFACE					-.030320	-.005120	-.005280	-57.960	-8026.422	-1857.657

TAIL INDUCED LOADS

			V FACTOR	B FACTOR	T FACTOR	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS
VTR V	-103.990	KIPS	1.00	198.06	41.00	-.054400	-.013138	-.012118	-103.990	-20596.228	-4263.563
VTR B	-9375.884	IN-KIPS	-	-	1.00	-	-	-.026649	-	-	-9375.884
VTR T	3758.073	IN-KIPS	-	-1.00	-	-	-.002397	-	-	-3758.073	-
LHT V	-65.225	KIPS	-	-	10.75	-	-	-.001993	-	-	-701.165
RHT V	1.342	KIPS	-	-	-10.75	-	-	-.000041	-	-	-14.427
LHT B	-6405.168	IN-KIPS	-	-	1.00	-	-	-.018205	-	-	-6405.165
RHT B	392.600	IN-KIPS	-	-	-1.00	-	-	-.001116	-	-	-392.600
WLN= 13	TOTAL TAIL LOADS ADDING TO AFT FUSELAGE					-.054400	-.015535	-.060122	-103.990	-24354.301	-21152.828
WLN= 14	TOTAL LOADS ON AFT FUSELAGE - LATERAL					-.084720	-.020655	-.065402	-161.949	-32380.723	-23010.485

SUMMARY PRINT OPTION

CASE 1 81 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 QEAF= 982.3
MR=ASYM TAS =1245.1

SAN= 1 WING - SG AXIS ITC= 3 SC= OFF SREF= 1946.000 BREF= 820.08 CREF= 184.05
WLN= 1

LEFT SIDE

CASE	PRESSURE INTEGRATED LOADS V KIPS	B IN-KIPS	T IN-KIPS	COEFFICIENTS CV	CB	CT	WIND TUNNEL DERIVED LOADS V KIPS	B IN-KIPS	T IN-KIPS	COEFFICIENTS CV	CB	CT
1	44.660	11975.619	-623.834	.023363	.007065	-.001773	48.992	13242.029	-1172.646	.025629	.005447	-.003353

RIGHT SIDE LOADS FOR ASYMMETRIC CASES

1	54.508	12003.230	-994.208	.028515	.007657	-.002826	72.207	17430.818	-2011.406	.037773	.011119	-.005717

SUMMARY PRINT OPTION

CASE 1 81 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
MR=ASYM TAS =1245.1

SAN= 2 HORIZ TAIL - SG ITC= 3 SC= OFF SREF= 238.770 BREF= 259.03 CREF= 149.36
WLN= 3

LEFT SIDE	PRESSURE INTEGRATED LOADS			COEFFICIENTS			WIND TUNNEL DERIVED LOADS			COEFFICIENTS		
CASE	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	-16.554	-1973.236	-802.605	-.070579	-.032479	-.022908	-65.225	-6405.168	3093.755	-.278066	-.105426	.068300
RIGHT SIDE LOADS FOR ASYMMETRIC CASES												
1	-6.222	-929.980	2267.415	-.026527	-.015307	.064715	1.342	392.600	488.134	.005722	.006462	.013932

SUMMARY PRINT OPTION

CASE 1 B1 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
MR=ASYM TAS =1245.1

SAN= 6 FWD FUS SG LAT ITC= 2 SC= ON SREF= 1946.000 BREF= 820.08 CREF= 164.05
WLN= 8

CENTERLINE

CASE	PRESSURE INTEGRATED LOADS			COEFFICIENTS			WIND TUNNEL DERIVED LOADS			COEFFICIENTS		
	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	-29.343	-7736.332	0.000	-.015350	-.004935	0.000000	-87.322	-23818.533	-2786.486	-.045560	-.013280	-.007920

SUMMARY PRINT OPTION

CASE 1 B1 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 QBAR= 982.3
MK=ASYM TAS =1245.1

SAN= 3 VERT TAIL - SG ITC= 3 SC= ON SREF= 247.400 BREF= 206.76 CREF= 188.95
#LN= 5

CENTERLINE CASE	PRESSURE INTEGRATED LOADS V KIPS	B IN-KIPS	T IN-KIPS	COEFFICIENTS CV	CB	CT	WIND TUNNEL DERIVED LOADS V KIPS	B IN-KIPS	T IN-KIPS	COEFFICIENTS CV	CB	CT
1	-76.454	-4990.317	1308.142	-.314595	-.099324	.028468	-67.044	-4392.483	1155.706	-.275872	-.087416	.025168

SUMMARY PRINT OPTION

CASE 1 81 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
MR=ASYM TAS =1245.1

SAN= 31 VT ROOT TOTAL ITC= 4 SC= ON SREF= 247.400 BREF= 206.76 CREF= 188.95
WLN= 6

CENTERLINE	PRESSURE INTEGRATED LOADS			COEFFICIENTS			WIND TUNNEL DERIVED LOADS			COEFFICIENTS		
CASE	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	-107.452	-10631.839	4201.147	-.442144	-.211589	.091489	-103.990	-9375.884	3758.073	-.427896	-.186592	.081840

SUMMARY PRINT OPTION

CASE 1 81 ARS SDSS-3C.2.1D 67.5WS,1.2M, 20K ALT,RIGID,ALPHA=0,DE=0,BETA=8 ALPHA= 0.00 BETA= 8.00 CBAR= 982.3
MR=ASYM TAS =1245.1

SAN= 33 AFT FUS SG L-TOT ITC= 4 SC= ON SREF= 1946.000 BREF= 820.08 CREF= 184.05
WLN= 14

CENTERLINE	PRESSURE INTEGRATED LOADS			COEFFICIENTS			WIND TUNNEL DERIVED LOADS			COEFFICIENTS		
CASE	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	-119.709	-26023.175	-16191.728	-.062623	-.016600	-.046022	-161.949	-32380.723	-23010.485	-.084720	-.020655	-.065402

```
SIM9ALO. 81/07/02.DFRC NOS (NOS10).

10.50.24.B1FS2,T100.
10.50.24.UCCR, AA01,        0.566KCDS.
10.50.24.USER(SIMS,)
10.50.24.CHARGE(14,62,FTN)
10.50.25.ATTACH(LGO=FSLIP3)
10.50.25.DEFINE(TAPE20=31G0P/CT=SPRIV)
10.50.25.DEFINE(TAPE40=B140P2/CT=SPRIV)
10.50.26.LDSET(PRESET=ZERO)
10.50.26.MAP(OFF)
10.50.26.LGO.
10.50.29.  CM LWA+1 =103154B, LOADER USED 123300B
10.50.42.    STOP
10.50.42.    114100 MAXIMUM EXECUTION FL.
10.50.42.     5.493 CP SECONDS EXECUTION TIME.
10.50.43.UEAD,       0.002KUNS.
10.50.43.UEPF,       0.029KUNS.
10.50.43.UEMS,       3.294KUNS.
10.50.43.UECP,       7.276SECS.
10.50.43.AESR,      11.913UNTS.
10.51.37.UCLP, AA04,        1.918KLNS.
```

8.3 Integration Option With Minimum I/O

In this final example, the geometry file and pressure data files already exist (GOP = 1 and POP = 2) so the card input is at a minimum. Output is minimized by executing IOP = 2 for symmetric flight cases where the aircraft is trimmed at 4 different load factors. Output for the vertical tail and lateral fuselage stations is suppressed with CARD 2A. The wind tunnel option is not executed. The only printed output is generated by the summary print option for the wing, horizontal tail, and vertical fuselage stations.

Card input listing for example 8.3

```
CARD          1         2         3         4         5         6         7         8
NO   12345678901234567890123456789012345678901234567890123456789012345678901234567890

  1       GUP 1     FJP 2     ROP 0     SUP 0     IOP 2     WOP 0
  2  TT  T T                        T                 INTEGRATE  SYMMETRIC
  3  01  01    WING - SG AXIS
  4  02  03    H T  - SG AXIS
  5  05  07    F F  - SG AXIS (VERT)
  6  07  09    A F  - SG AXIS (VERT)
  7  32  11    A F  - TOTAL   (VERT)
  8                 SUMMARY PRINT TERMINATOR
  9  1   04   1255.0    VTAS
 10  1   14   -2.16     DE
 11  2   14   -3.00     DE
 12  3   14   -4.75     DE
 13  4   14   -6.66     DE

 14  7/8/9       END OF RECORD       1

 15  4.0        CASES
```

Program output listing for example 8.3

```
INTEGRATION OPTION    AND    ADDITIONAL  LOADS  OPTION


CASE  1  COMPLETE

CASE  2  COMPLETE

CASE     COMPLETE

CASE  4  COMPLETE
```

SUMMARY PRINT OPTION

CASE 1 MR= SYM	81 ARS	JDSS-3E.2.2A	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=0.65	ALPHA= .84 DE= -2.16	BETA= 0.00	CBAR=1067.3 TAS =1255.0
CASE 2 MR= SYM	81 ARS	JDSS-3E.2.2B	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=1.0	ALPHA= 1.66 DE= -3.00	BETA= 0.00	CBAR=1067.3 TAS =1255.0
CASE 3 MR= SYM	81 ARS	JDSS-3E.2.2C	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=1.685	ALPHA= 3.93 DE= -4.75	BETA= 0.00	CBAR=1067.3 TAS =1255.0
CASE 4 MR= SYM	81 ARS	JDSS-3E.2.2D	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=2.436	ALPHA= 6.20 DE= -6.68	BETA= 0.00	CBAR=1067.3 TAS =1255.0

SAN= 1 WING - SG AXIS ITC= 3 SC= OFF SREF= 1946.000 BREF= 820.08 CREF= 164.05

LEFT SIDE PRESSURE INTEGRATED LOADS COEFFICIENTS

CASE	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	41.576	6505.054	-683.997	.020018	.005169	-.001789
2	57.732	12142.315	-456.559	.027796	.007129	-.001194
3	90.551	16924.751	7.635	.043598	.011111	.000020
4	126.512	26357.385	526.362	.060912	.015475	.001351

RIGHT SIDE LOADS = LEFT SIDE (SYMMETRIC MOTION FOR ALL CASES)

SUMMARY PRINT OPTION

CASE= 1 MR= SYM	81 ARS	SDSS-3E.2.2A	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=0.65	ALPHA= .64 DE= -2.16	BETA= 0.00	QBAR=1067.3 TAS =1255.0
CASE= 2 MR= SYM	81 ARS	SDSS-3E.2.2B	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=1.0	ALPHA= 1.66 DE= -3.00	BETA= 0.00	QBAR=1067.3 TAS =1255.0
CASE= 3 MR= SYM	81 ARS	SDSS-3E.2.2C	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=1.685	ALPHA= 3.93 DE= -4.75	BETA= 0.00	QBAR=1067.3 TAS =1255.0
CASE= 4 MR= SYM	81 ARS	SDSS-3E.2.2D	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=2.436	ALPHA= 6.20 DE= -6.68	BETA= 0.00	QBAR=1067.3 TAS =1255.0

SAN= 2 HORIZ TAIL - SG ITC= 3 SC= OFF SREF= 238.770 BREF= 259.03 CREF= 149.38

LEFT SIDE PRESSURE INTEGRATED LOADS COEFFICIENTS

CASE	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	-29.737	-3079.206	1303.309	-.116689	-.046647	.035813
2	-32.264	-3274.790	1385.721	-.126605	-.049610	.036428
3	-37.805	-3715.817	1455.706	-.148349	-.056291	.038240
4	-44.091	-4222.117	1542.576	-.173015	-.063961	.040522

RIGHT SIDE LOADS = LEFT SIDE (SYMMETRIC MOTION FOR ALL CASES)

SUMMARY PRINT OPTION

```
CASE  1   61 ARS   SDSS-3E.2.2A   67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=0.65    ALPHA=   .84   BETA=  0.00   CBAR=1067.3
MR= SYM                                                                              DE=  -2.16                 TAS =1255.3
CASE  2   61 ARS   SDSS-3E.2.2B   67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=1.0     ALPHA=  1.86   BETA=  0.00   CBAR=1067.3
MR= SYM                                                                              DE=  -3.00                 TAS =1255.0
CASE  3   61 ARS   SDSS-3E.2.2C   67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=1.685   ALPHA=  3.93   BETA=  0.00   CBAR=1067.3
MR= SYM                                                                              DE=  -4.75                 TAS =1255.0
CASE  4   61 ARS   SDSS-3E.2.2D   67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=2.436   ALPHA=  6.20   BETA=  0.00   CBAR=1067.3
MR= SYM                                                                              DE=  -6.68                 TAS =1255.0
```

SAN= 5   FWD FUS SG VERT   ITC= 1   SC= ON   SREF= 1946.000   BREF= 820.00   CREF= 184.05

CENTERLINE   PRESSURE INTEGRATED LOADS   COEFFICIENTS

CASE	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	18.123	-1593.754	0.000	.008726	-.000936	0.000000
2	22.223	-560.519	0.000	.010700	-.000329	0.000000
3	30.537	1523.798	0.000	.014763	.000895	0.000000
4	39.602	3794.594	0.000	.019067	.002228	0.000000

SUMMARY PRINT OPTION

CASE 1 MR= SYM	61 AFS	SDSS-3E.2.2A	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=0.65	ALPHA= .84 DE= -2.16	BETA= 0.00	CBAR=1067.3 TAS =1255.0
CASE 2 MR= SYM	61 AFS	SDSS-3E.2.2B	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=1.0	ALPHA= 1.86 DE= -3.00	BETA= 0.00	CBAR=1067.3 TAS =1255.0
CASE 3 MR= SYM	61 AFS	SDSS-3E.2.2C	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=1.665	ALPHA= 3.93 DE= -4.75	BETA= 0.00	CBAR=1067.3 TAS =1255.0
CASE 4 MR= SYM	61 AFS	SDSS-3E.2.2D	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=2.436	ALPHA= 6.20 DE= -6.68	BETA= 0.00	CBAR=1067.3 TAS =1255.0

SAN= 7 AFT FUS SG VERT ITC= 1 SC= ON SREF= 1946.000 BREF= 620.06 CREF= 164.05

CENTERLINE PRESSURE INTEGRATED LOADS COEFFICIENTS

CASE	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	1.066	-1707.227	0.000	.000513	-.001002	0.000000
2	-.549	-2445.501	0.000	-.000264	-.001436	0.000000
3	-3.663	-3947.876	0.000	-.001631	-.002318	0.000000
4	-7.542	-5592.994	0.000	-.003535	-.003284	0.000000

SUMMARY PRINT OPTION

CASE 1 MR= SYM	81 ARS	SDSS-3E.2.2A	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=0.65	ALPHA= .84 DE= -2.16	BETA= 0.00	CBAR=1067.3 TAS =1255.0
CASE 2 MR= SYM	81 ARS	SDSS-3E.2.2B	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=1.0	ALPHA= 1.86 DE= -3.00	BETA= 0.00	CBAR=1067.3 TAS =1255.0
CASE 3 MR= SYM	81 ARS	SDSS-3E.2.2C	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,NZ=1.685	ALPHA= 3.93 DE= -4.75	BETA= 0.00	CBAR=1067.3 TAS =1255.0
CASE 4 MR= SYM	81 ARS	SDSS-3E.2.2D	67.5WS,1.20M,18K ALT,ELASTIC,316K GW,N.-2.435	ALPHA= 6.20 DE= -6.66	BETA= 0.00	CBAR=1067.3 TAS =1255.0

SAN= 32 AFT FUS SG V-TOT ITC= 4 SC= ON SREF= 1946.000 BREF= 620.06 CREF= 184.05

CENTERLINE PRESSURE INTEGRATED LOADS COEFFICIENTS

CASE	V KIPS	B IN-KIPS	T IN-KIPS	CV	CB	CT
1	-58.406	-16975.180	0.000	-.028122	-.011140	0.000000
2	-61.077	-20395.837	0.000	-.031333	-.012327	0.000000
3	-79.413	-25345.970	0.000	-.038235	-.014881	0.000000
4	-95.524	-30258.610	0.000	-.045992	-.017753	0.000000

```
SIMQAZE. 81/07/07.LFRC NOS (NOS10).

15.50.50.EIFS3,T100.
15.50.51.LOCK, AA01,          0.026KCDS.
15.50.51.USER(SIMS,)
15.50.51.CHARGE(14,62,FTN)
15.50.51.ATTACH(LGO=FSLIP3)
15.50.51.ATTACH(TAPE20=81GOP)
15.50.52.ATTACH(TAPE11=33E22A)
15.50.52.ATTACH(TAPE12=33E22B)
15.50.52.ATTACH(TAPE13=33E22C)
15.50.53.ATTACH(TAPE14=33E22D)
15.50.54.LDSET(PRESET=ZERO)
15.50.54.MAP(OFF)
15.50.54.LGO.
15.51.04.  CM LWA+1 =105154B, LOADER USED 123300B
15.51.20.     STOP
15.51.20.     114400 MAXIMUM EXECUTION FL.
15.51.20.      3.602 CP SECONDS EXECUTION TIME.
15.51.21.UEAD,        0.002KUNS.
15.51.21.UEPF,        0.053KUNS.
15.51.21.UEMS,        2.931KUNS.
15.51.21.UECP,        5.411SECS.
15.51.21.AESR,        9.523UNTS.
15.51.45.UCLP, AA04,         0.745KLNS.
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Dryden Flight Research Center
National Aeronautics and Space Administration
July 17, 1981

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16. Abstract

This report constitutes the FSLIP program documentation and user's manual. As a follow-on program to the FLEXSTAB computer analysis system, the primary function of this Fortran IV program is to integrate panel pressure coefficients computed by FLEXSTAB to obtain total shear, bending, and torque airloads on various surfaces, summed relative to user specified axes. The program essentially replaces the ALOADS module in FLEXSTAB with expanded capabilities and flexibility. As such, FSLIP is generalized to work on any FLEXSTAB model or other pressure data if in a compatible format.

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